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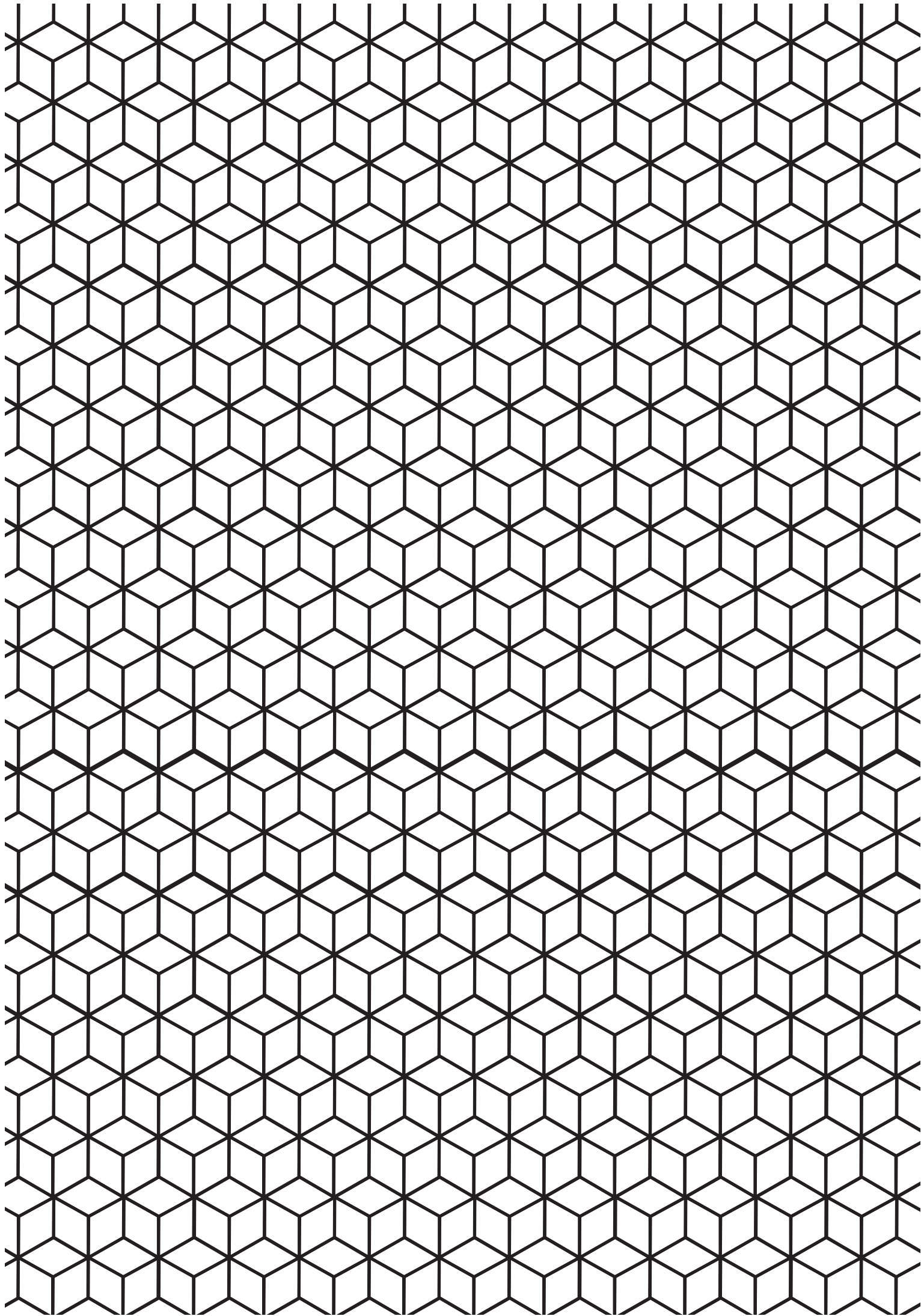
# **Innovation Systems**

## **Capturing New Ideas for Innovations in Research Oriented Organizations and Technology Companies**

Aleksanteri Eliel Heliövaara  
Aalto University, School of Arts, Design and Architecture  
International Design Business Management  
Supervisors: Prof. Peter McGrory, Prof. Anne Stenros  
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**Aalto University**



# Abstract

The stage before ideas are transferred into projects in companies and organisations is often referred to as the front-end of innovations. This study investigates the activities that take place in the front-end and tries to better understand the factors that affect idea generation and diffusion in organisations and companies. In other words - this study tries to understand the steps that new ideas for innovations take from the first time they are introduced to an organisation or a company – to the idea-to-project decision.

The purpose of this study is to better understand the new idea for innovation generation phenomena and the diffusion of the idea that takes place in a technology-oriented company and technology-oriented research organisation.

The theoretical frame for this study is in understanding of new product development and processes for new innovation creation in companies and research organisations. Many studies about the formalities revolving around innovations exist – and lately the front end of innovations has also become a target of increasing interest.

In this study 9 globally active private sector technology companies and public sector research organisation representatives were interviewed. These semi-structured theme interviews among the experts were interpreted and conclusions about their organisations' innovation activities were drawn. Each expert presented a case within the organisation, which related to the front-end and idea diffusion activities. In total this study is built on 7 individual case examples collected from these companies and research organisations.

This study tries to define the actions that affect how ideas are generated, collected and shared within organisations. As an outcome of this research - a model for idea-to-project activity is presented. This model is a combination of the studied activities for idea diffusion used in the organisation and understanding gathered from the theoretical framework.

**Key words:** Innovation Management, Front-end of innovation, Research Organisations

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# List of Abbreviations and Symbols

NPD	New Product Development
NSD	New Service Development
CERN	European Organisation for Nuclear Research
MVP	Minimum Viable Product
CBI	Challenge Based Innovation -course
TALENT	Research group focused on piloting new state-of-the-art technologies on the new precision pixel detector used in the ATLAS experiment and the LHC in CERN
LHC	Large Hadron Collider, a particle collider used in CERN
ATLAS	LHC Apparatus, is one of the seven particle detector experiments constructed at the LHC particle collider at CERN
ICT	Information and Communication Technology
ASIC	An application-specific integrated circuit customised for a particular use, rather than Indented for general-purpose use.
FEI	Front End of Innovation Process
FEE	Fussy Front End
PSRO	Public Sector Research Organisation
CoP	Community of Practice
VCoP	Virtual Community of Practice
MCSRd	Multiple Case Study Research Design
ROI	Return on Investment
IPR	Intellectual Property Rights
CEO	Chief Executive Officer
CTO	Chief Technology Officer
CIO	Chief Innovation Officer
IoT	Internet of Things
IVC	Innovation Value added Chain

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# **INTRODUCTION**

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## **Background**

**What can technology oriented companies learn from the way ideas are carried out from the front end of innovation (FEI) process into the formal stage of product or service development process in research-driven organisations?**

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**Does the process** differ and can the same innovation management frameworks be used in organisations aiming for different goals? Can the knowledge created about the best ways of ideating be transferred between private sector companies and Public Sector Research Organisations? (PSRO) How can the knowledge be transferred from one organisation to another and can different communities of practice (CoP) adopt methods for ideating new innovations from one another?

Innovation Management is a complex task that requires improved methods to support the exploration of multiple innovation dimensions e.g. product portfolio management. The term 'innovation' can in the simplest form be defined as "the successful exploitation of new ideas" and managing these dimensions requires support from an innovation management model or a framework (A. Mabogunje et al. 2014). The front end of innovation (FEI) presents one of the greatest opportunities for improving the overall innovation process and as a consequence of this is the target of increasing interest. The front part of the innovation process is in the extent innovation literature sometimes referred to as the "fussy front end of innovation" (FFE) - but as claimed by P. Koen et al. (2001) this sort of terminology suggests that there are uncontrollable and unknown factors controlling this part of the innovation process. This sort of terminology might lead into certain attitude towards this area of research.

As determined by P. Koen et al. (2001) the front end of innovations is usually described as the prior stage that takes place in the New Product Development (NPD) or New Service Development (NSD) process before the formal steps of the innovation process are conducted. In the extent innovation literature – this stage is often defined as the "front end of the innovation process". (P. Koen et al. 2001)

Innovators create new product innovations yet still struggle with finding formal management frameworks and models to capture the most essential ideas for further development. It is challenging for companies working with NPD processes to manage the front end of innovations and it is critical to come up with new appropriate theories and proposals that support the successful front end of innovations. As suggested in a research concerning technology road-mapping and portfolio management in the front end of innovations conducted by Oliveira et al. (2010) - case studies conducted in companies with different organisational characteristics and products could be an addressed issue in the future research (Oliveira et al. 2010).

This research is a combination of qualitative studies conducted in two fields that hypothetically have different approaches towards innovations and specifically to the FEI. Firstly this research will study the ways that technology oriented private technology companies manage their front-end innovation processes and secondly how these processes are conducted in public sector research organisations.

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*Are there differences in the innovation processes undertaken in companies and research-driven organisations?*

**The interest** in this comparison arises from the hypothetically different goals that the processes in these fields have for their innovations. Does the research oriented innovation process maintained by public sector research organisations differ greatly from the one used by private companies? Do private sector companies settle with short-term success and do public sector innovation processes have long-term success in mind? Do the processes have significant differences and do the outputs of these processes differ? What kind of innovation culture is created in these fields to generate and implement the best ideas? A comparison between these findings is made using the data collected from professionals working in these fields.

My personal interest to the public sector research organisations rose from Challenge Based Innovation (CBI) -project conducted as collaboration with the European Organisation for Nuclear Research (CERN), Aalto University and two other European universities in 2013-14. The CBI project was an eight-month test platform for CERN to test a new innovation method of bringing multiple disciplines from different universities to work together by using methods adopted from design thinking originally created in Stanford University in the Californian Silicon Valley and the D-School of the Hasso-Plattner -Institute in Potsdam, Germany (Meinel et. al., 2011). As an outcome of this project a concept for an online communication tool was created for a research group working in CERN named TALENT. This research group focuses on piloting new state-of-the-art technologies on the new precision pixel detector used in the ATLAS experiment and the Large Hadron Collider (LHC) in CERN. The communication tool designed during the CBI was created to clarify remote meetings and communication within this multinational and multidisciplinary research group.

The first step in this research was the gathering of preliminary information collected by other researchers prior to this study. The findings from these preliminary studies were collected into the literature review, which is used as a foundation to my research. On this basis I outlined a set of research questions, which I try to answer by collecting data from experts I have chosen to be added into my sample from the population of innovation professionals from private sector companies and public sector research organisations.

**The research questions** and methodology play an essential role in this study. Firstly setting relevant questions defines the positioning of this research and secondly the methodology used to capture the data defines the outcome. This is why in this chapter these operations are described in detail. My goal is to form a good understanding for my reader about the approach I have chosen for my study. As stated by H. Nordlund (2009) - “There are many approaches that can be taken towards the front end of innovations – and the decision in this affects the outcome of the research“ (H.Nordlund, 2009).

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## **Structure of the research**

As stated previously - the setting of questions for the research plays a fundamental role in this study and understanding the previously collected information in the context of front end of innovations is the key to conducting relevant research.

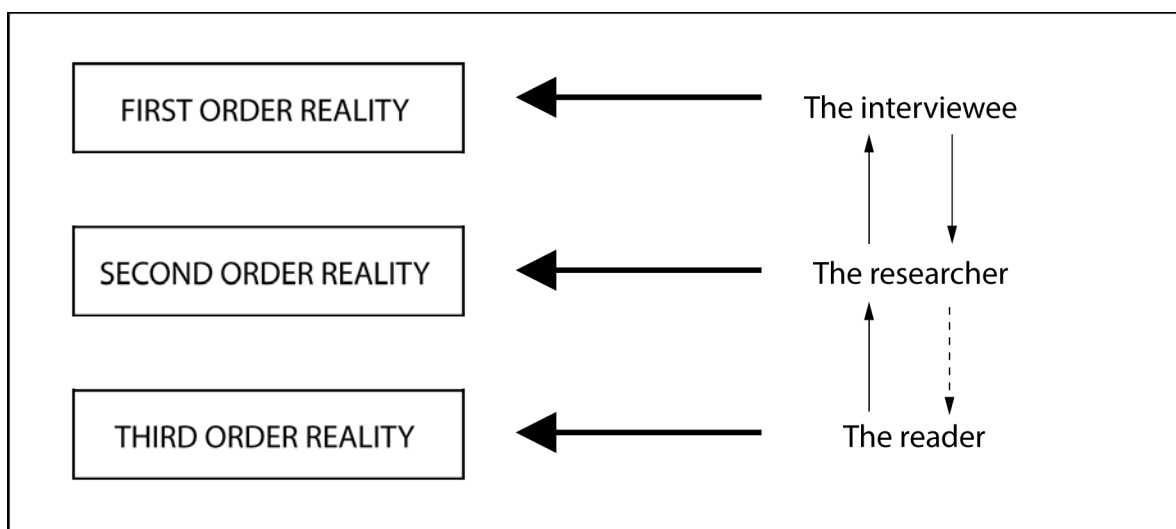
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**As the questions** are set and the sample is gathered the next step is to create supporting methodology for collecting the needed set of data.

**Not only** setting relevant research questions create insightful studies. Also creative ways of using methodologies for gaining data and coding to find information from the collected data is vital for the outcome of the research. The research process is a multi sided task that requires understanding in many levels of science. It is not a linear process where the researcher is ready or understanding the phenomena studied in the beginning – but an iterative learning process with many steps back and forth whilst gaining better understanding about the topic.

**As my role** in the study is visible in selecting the sample, creating research questions and interview questions – my neutrality in the study can be questioned. This might lead into biases when trying to for example re-enact the research I have conducted. This might be the result of the nature of interviewing as a method – which is dialogic and always feeds itself on the way. Of course leading questions automatically lead into biased data in interviews but understanding that the reality created between the interviewee and the interviewer is always unique. When analysing outcomes of this study it is vital to understand the different realities that are created between stages of data interpreting. As seen in the figure below (Fig 1), there are three realities that can be found from the research. These realities are the interpretations of the interviewee, the researcher him self and finally the reader. The differences between these realities can create challenges in the understanding between the researcher and the reader. It is challenging to act as a responsible interpreter between the knowledge of the interviewee and the reader and to try to convey the information collected about the phenomena at hand. This process is also affected by other entities. Other experts' opinion in mind the researcher tries to keep up the neutrality needed.



*Fig. 1: Three levels of realities in research*

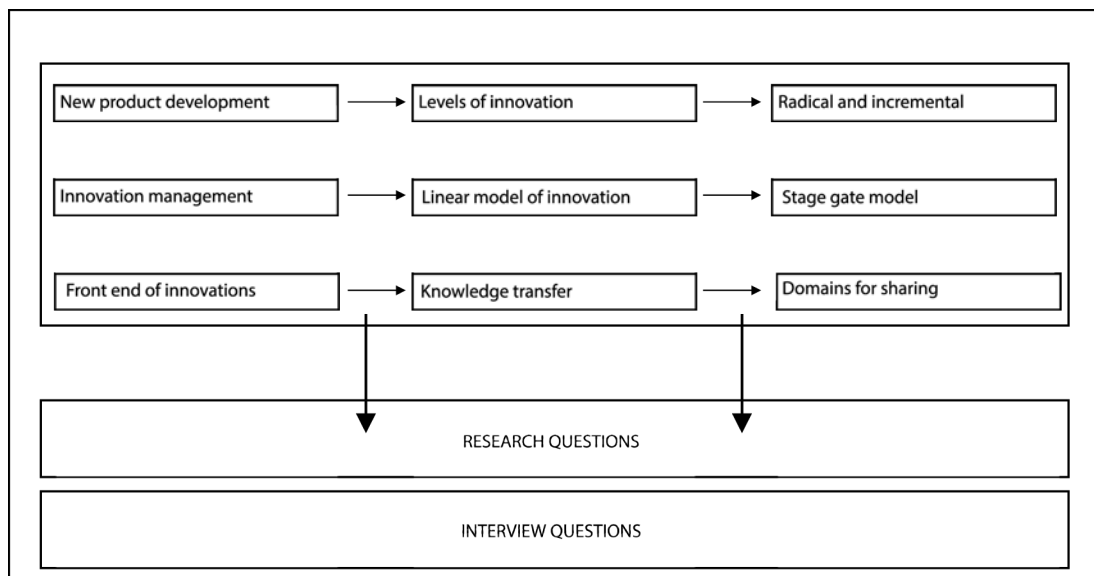
*Source: H. Nordlund, (2009)*

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# **LITERATURE REVIEW**

**The literature** review works as a basis for understanding the space where this research is conducted. Clearly defining the topics discussed while collecting qualitative data makes me as a researcher better understand the reality of the interviewee. The experts in the field of innovation management interviewed for this research have gained deep knowledge in innovation management and frameworks and this is why understanding their field is relevant for me as a researcher to be able to reflect and interpret their knowledge in a beneficial way. The literature review is used for defining the scope of this research and to create meaningful research- and interview questions.

**The topics** for the review have been selected keeping in mind three stages in innovation processes. Firstly the preliminary ideations stage – the front end of the innovation process, which plays a significant role in this research. Secondly the formal NPD process and frameworks for innovation management to help understand the overall process of innovations in private sector companies and public sector research organisations. And thirdly the ways for knowledge transfer to create clear understanding on how the findings of this research could benefit the private sector technology companies in developing their front end of innovation processes.



*Fig. 2: Structure of the Literature review*

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## **New product development**

**New Product Development (NPD)** is a process where a new product or a service is created using a product development strategy, model or a framework to define the starting point and in most cases steps taken during the creation of a new product/service.

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**In this research** the NPD process is understood as a new product development process conducted in a company or a research organisation aiming to create a new product or a service to be launched to a market or for research purposes. The term NPD in the extent innovation literature sometimes combines the product and service category of innovation thus these can also be divided into new product and new service development (NSD). The NPD process can be used in many different setups and product categories aimed for several different markets. This research will mainly focus on the NPD and NSD processes conducted in the field of technology in the contexts of private sector technology companies and public sector research organisations.

**NPD** is often seen as a complex process that includes multiple steps to create, develop and market new products or services. Usually different frameworks and models are used to gather, combine and process new ideas and existing solutions into new products. Predictions concerning the markets needs are used for creating strategies that define the ways markets are pursued.

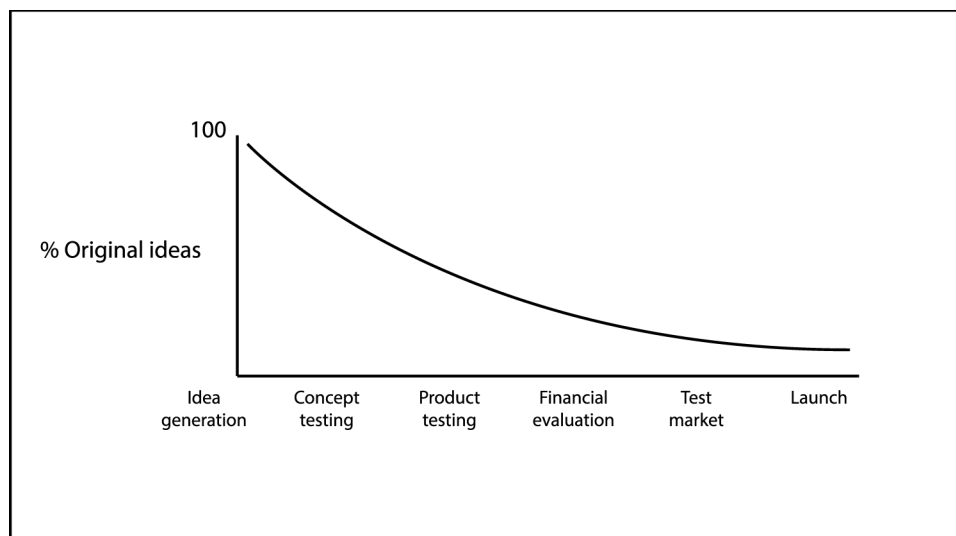
**In a research** conducted by Ian Goulding (1983) new product development was seen as a hard task for companies to achieve. Even as new product development is required for the future security of a company, product revitalisation or alternative forms of diversification may fulfil short-term corporate needs (I. Goulding, 1983). Later research has shown that fulfilling short-term needs by making incremental changes to existing products and services might be a solution for stable success but when successful, radical product development might lead into greater profits (Zakić et al., 2008).

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*The differentiation strategy means creating products and brands that can be distinguished from the competitive ones and which the customers are willing to pay a higher price for (M. Porter, 1980).*

**In the current** literature, Porter (1980) has argued that there are two different ways for a company to approach the markets with their products. Companies can either try to differentiate from their competition with product features or try to reduce the cost of the products and this way gain competitive advantage in the markets.

**In a study** conducted by Christoph Lock (2000), different variables for successful NPD were listed from data collected from different scholars from the field on innovation and NPD. This data was put into two categories. Firstly the definition of the success variables in the market and secondly the characteristics that made a successful NPD project. The success factors in the NPD include factors such as customer orientation and demand pull, cross-functional, co-operation, top management support, existence of a champion, good planning and execution with a strong project manager, and the use of a well-defined process with formal measures. As can be seen there exist many suggested success variables about the best practises for successful NPD processes but Lock claims that all companies should develop a customised NPD project portfolio and mixture of processes which together are relevant to the company and by doing so, should find their own best practices (Loch C. 2000). Or as said by Ian Goulding: “There can be no generalised approach to new product development, since each company's needs in this field are unique“ (I. Goulding 1983).



*Fig. 3: Screening of New Product Ideas*

Source: Goulding, (1983)

Success driver	Study
<b>Market characteristics that increase NPD success chance:</b>	
large market	Rothwell et al. (1974); Zirger and Maidique (1990)
fast growing market	Zirger and Maidique (1990); Montoya-Weiss and Cantalone (1994)
market where you have a strong position	Krogh et al. (1988)
market or technology with high newness is risky	Krogh et al. (1988); Wheelwright and Clark (1992); Roussel et al. (1991)
product with high competitive attractiveness	Cooper (1994); Cooper et al. (1994); Cooper and Kleinschmidt (1995); Kleinschmidt and Cooper (1991); Montoya-Weiss and Cantalone (1994); Griffin and Page (1993)
<b>NPD process characteristics that increase project success chance:</b>	
customer orientation, demand pull	Rothwell et al. (1974); Mansfield and Wagner (1975); Cooper and Kleinschmidt (1987, 1995)
functional competence	Cooper and Kleinschmidt (1987); Zirger and Maidique (1990)
cross-functional cooperation	Cooper and Kleinschmidt (1995); Clark and Fujimoto (1991); Moenart et al. (1994); Gatignon and Xuereb (1997)
top management support	Montoya-Weiss and Cantalone (1994); Brown and Eisenhardt (1995); Cooper and Kleinschmidt (1995)
formalized project selection	Cooper et al. (1997); Roussel et al. (1991)
rigorous planning and execution	Brown and Eisenhardt (1995); Clark and Fujimoto (1991); Cooper and Kleinschmidt (1987)
early specification, tight process with formal measures	Ransley and Rogers (1994); Wheelwright and Clark (1992); Cooper and Kleinschmidt (1995)
strong project manager	Brown and Eisenhardt (1995); Clark and Fujimoto (1991); Wheelwright and Clark (1992)
Process contingency: use less structure in uncertain	Eisenhardt and Tabrizi (1995); Lynn et al. (1996); Leifer

*Fig. 4: Project Success Drivers from the literature*

Source: Christoph Lock, 2000

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## **Stage Gate model**

The original Stage-Gate Model was created in the 1980's based on research conducted among so called “intrapreneurs” working within big corporations.

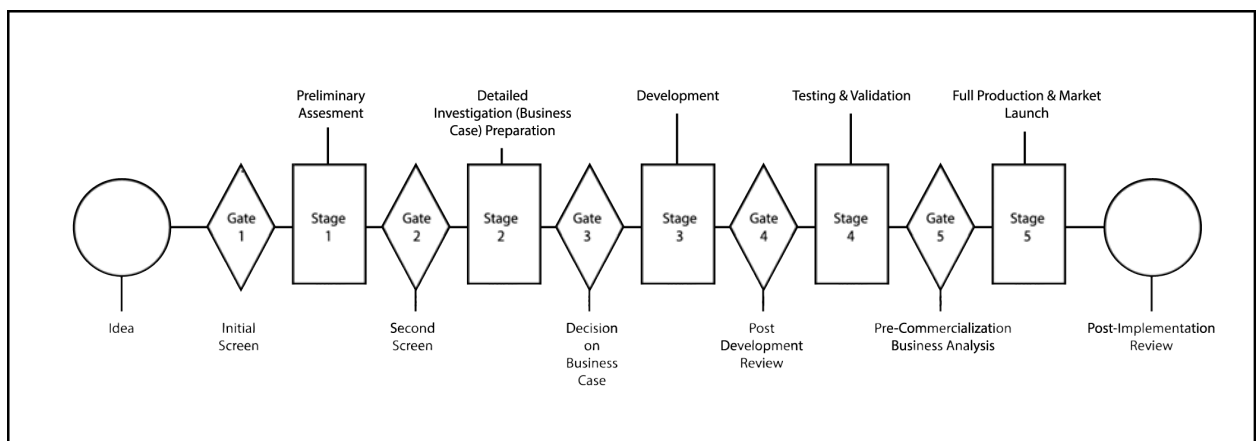
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These intrapreneurs drove successful new products to the markets and the learning's and lessons from these processes were transformed and incorporated into many practices and provided the fundamentals to what now is known as the Stage-Gate model (*R. Cooper, 1990*).

**Stage gate model** is an innovation model that covers the “Idea-to-Launch” process in a NPD project with different stages. In the Stage-Gate model the innovation process is divided into steps from ideation until the launch of a new product. These well-defined steps in the innovation process have different roles within the innovation process. These steps are either called “stages” or “gates”. During the innovation process the project at hand is validated between each of the stages. These validation points are called “gates” and these gates are placed between the stages to ensure the quality control before entering the next stage in the innovation process.

Each of the well-defined stages has their own parameters for the gates that define whether the current project will be continued or not. The project has to hand in defined set of deliverables or inputs in each of the gates. These gates have a set options or outputs which are called “Go”, “Kill”, “Hold” and “Recycle”. Defined parameters and measures are used to measure the possible project success and possible future profitability.

Gates are usually controlled by senior managers who act as so called "gatekeepers," This group of gatekeepers is typically multidisciplinary and multifunctional, and its members are senior enough to have the authority to approve the resources needed by the project. Three key roles have been defined for the gatekeepers.



*Fig. 5: An Overview of a Stage-Gate Process*

Source: R. Cooper, 1990

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# Roles of the gatekeepers:

## 1.

Reviewing the quality of the inputs or deliverables set for the project in each gate.

## 2.

Making the go/kill/hold/recycle -decisions by using defined parameters. These parameters are usually defined from business opportunity and economic standpoint.

## 3.

In the case of “go” decision – the gatekeeper gives the approval of the action plan for the next stage and the allocation of necessary resources for the project. (R. Cooper, 1990)

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**R. Cooper (1980)** came to a conclusion that many companies use similar stage-gate systems and however they have different names and they seem unique to the companies, they still have similarities between different stage-gate approaches.

These stage-gate systems recognise that product innovation is a process. And like other processes, innovation process can be managed. Stage-gate systems simply apply process-management methodologies to these innovation processes. Cooper (1990) also states that companies need incremental innovations but even more they are in need for radical innovation and new products to create sustainable growth and business opportunities. This translates into better innovation management and to the use of the Stage-Gate model (R. Cooper, 1990).

The preliminary idea of the stage gate model is to remove the possibility of having variance with in the NPD process.

The best way to improve the output of the process is to focus on the process itself. By creating defined and formal steps into the process variance can be reduced. The Fig. 5. represents a generic overview of a stage gate model. This model presented by Cooper (1990) works as a basic structure and basis for the more tailored versions created for companies for their particular needs. This basic model is constructed from five stages and gates. It starts from the ideation of a product and ends into the product launch phase. First part of the model is the “Idea” or “Discovery” narrowly defined by R. Cooper (1990). Innovation literature defines this phase as the “front-end” of innovation processes and practices, and it's more discussed in the later parts of this research (R. Cooper, 1990; M.Schilling, 2013).

In the Table 1., a more detailed model of the stage gate process is conveyed.

The steps taken during the stage gate model are defined but the steps are finalised by the company or an organisation while using the system for their own innovation strategy. After the 5<sup>th</sup> stage a post-launch review takes place where the key leanings from the process are garnered and reviewed.

Gate 1. Initial Screen	According to Cooper (1990) - the first gate is a gentle gate where the criteria for the key “must meet” and “should meet” criteria are set. These criteria deals with strategic alignment, project feasibility, magnitude of the opportunity, differential advantage and synergy with the firm's core business and resources and market attractiveness. Financial criteria are not part of this first gate.
Stage 1. Preliminary Assessment	The projects economical and financial potential and needs are roughly researched. These are accomplished by contacting key users, focus groups, and even a quick concept test with a handful of potential users for example. Alongside this a preliminary technical assessment is carried out during this stage. Defined by Schilling (2013) “This is a stage where preliminary scoping for the project is done by utilising easy to obtain information to narrow the list of potential projects. “
Gate 2. Second Screen	The project is again similarly evaluated using the original set of “must meet” and “should meet” criteria used in the first gate. These criteria how ever are considered dealing with sales force and customer reaction data collected from the stage 1. Financial success is roughly measured with the payback period for example.
Stage 2. Definition	The final stage prior to the heavy spending for the project. In this stage the project should be clearly defined. In this stage market research and customer testing should be conducted. This is done to measure the customer acceptance. The product should be conceptualised into a small scale and ready for scaling up in up coming stages. According to Schilling (2013) this is a stage where project justification takes place.
Gate 3. Decision on Business Case	Financial evaluation is important to this screening. At Gate 3, agreement should exist on a number of key decisions. These items include target market definition; definition of the product concept, specification of a product positioning strategy and definition of the product benefits to be delivered; and agreement on essential and desired product features, attributes, and specifications.
Stage 3. Development	In this stage the product development is carried out alongside with detailed testing, marketing, and operations plans. Also updated financial plan, patent and copy write issues are taken care of. In this stage the plans for the production and launch are made.
Gate 4. Post Development Review	The attractiveness of the project is measured and the quality of the work done in the past stages is measured. A financial analyse is done by using the new more accurate data collected during the process. The 4 <sup>th</sup> gate also reviews the possibility of external testing for the project.
Stage 4. Testing & Validation	This stage evaluates the viability of the project. In this stage multiple different actions are undertaken and measured. These actions are: in house product and quality tests, user and field trials to measure the products viability in the actual user scenario and to find out actual customers reactions to the product, trial and pilot production tests to find out more detailed cost structure and the creation of a launch plan. Trial selling can be conducted.
Gate 5. Pre-commercialisation Decision	This is the final gate before the full commercialisation. This is the last step where the project can still get the “kill” decision from the gatekeepers. This gate focuses on the quality of the activities at the validation stage and their results. Financial projections play a key role in the decision to move ahead.
Stage 5: Commercialisation	This final stage involves implementation of both the marketing launch plan and the operations plan.

*Table 1: Structure of the Stage-Gate Process, Source: R. Cooper, 1990*



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## Discussion about the stage gate model

Stage-Gate model has also suffered from criticism and it has been blamed for its time-consuming nature, which results into time wasting.

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**Other downsides** include bureaucratic procedures, no provision for focus, and restriction of learning opportunities (J. Grönlund, 2010).

**Time has passed** from the first model which was created in the 80's and world has evolved into faster paced, more competitive, global, and less predictable. In this new context the Stage Gate model has been said to be too linear, too rigid, and too planned to handle more innovative or dynamic projects. It is not flexible for different kinds of projects and the idea of one-size should fit all might be less suitable for the more complex innovation scene compared to the one in the 90's. The system is said to be too controlling, bureaucratic, loaded with reporting, checklists and much non-value added work. The model also doesn't allow experimentation (J. Grönlund, 2010).

**This criticism** has led to creation of a revised version of the old stage gate model created to better suite now existing, fast phased innovation culture. R. Cooper (1990) - the creator of the original Stage- Gate model was asked several times to answer to the question "what is the next step for the stage gate model?" Three decades after publishing the first model, Cooper (2014) made a research about the revised version as an answer to this question. This revised stage gate model is a collection of actions that companies have undertaken to improve the old process model. He studied what leading firms are doing to move beyond their current idea-to-launch methodology and integrated these practices into a next-generation process model (R. Cooper, 2014). The next generation idea to launch system is called a Triple A system. According to Cooper (2014) it is more adaptive and flexible, agile, and accelerated (R. Cooper, 2014).

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## **Radical and incremental innovations**

In this section I will explain the meaning of degree in the setup of innovation management. Innovations have been named and measured in many ways in the extent innovation literature and the measure of radicalness is one of the key factors indicating innovations competence.

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**Innovative** product development processes are commonly divided into two different categories, which are radical and incremental innovation processes. This differentiation is sometimes also called the level or degree of innovation as it states the level of radicalness for the outcome of the innovation process. The radicalness can mean either radicalness in scale of the companies existing product portfolio or even radicalness in the existing market place. Well stated in the extent literature: “In the contrary of radical and incremental - the radical innovations create fundamental changes that effect as revolutionary changes in technology.” These innovations are seen as a total departure from the existing way the technology is seen and used before (R, Dewar et al., 1986).

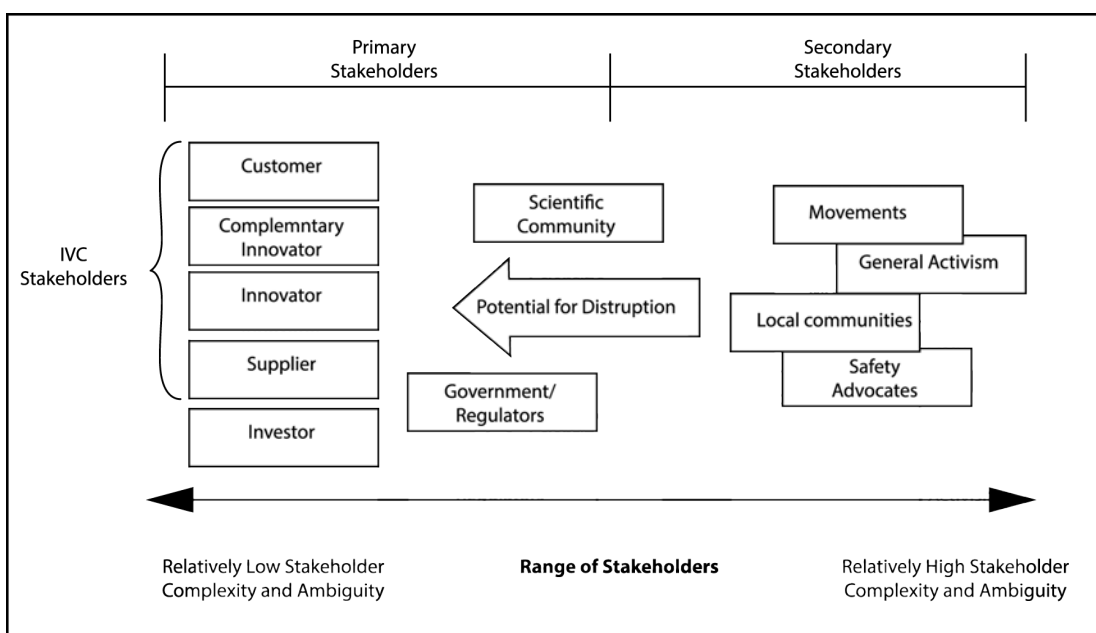
**An extensive** research has been carried out in Ireland, which included 6177 companies during the period between 2002 and 2004. In this study it was distinguished that the business setup between radical and incremental innovations of both product and processes innovations have better rate of success, while radical ones are more risky but have excellent returns in the case of success (Zakić et al., 2008; Forfás Innovation Survey, 2006).

**Speidel (2007)** states that the radical product development projects present significant challenges to development teams. In such settings existing formal processes may be limited or inappropriate, and objectives may be ambiguous and changing (V. Speidel, 2007). The incremental innovation in contrast is a small adjustments and simple improvement made to the existing technology (R. Dewar et al. 1986).

**Radical innovation** management practices differ from those used in managing incremental innovations. These radical innovations in return create fundamentals for new generations of product categories and this way can be seen as beneficial targets for resource allocation within companies. Although difficulties finding a consensus about the definition of radical innovation occur in the extent innovation literature, McDermot et al. (2002) use Green et al.'s “four dimensions for defining radicalness” which seems to clarify the otherwise rather unclear definition of radicalness in innovation processes (C. McDermot et al. 2002). These dimensions are:

- 1. Technological uncertainty,**
- 2. Technical inexperience,**
- 3. Business inexperience and**
- 4. Technology cost**

**Radical innovations** play a role in creating disruptive technologies that are sufficient for disrupting their existing industry and market base. The current management of technology emphasise the need to recognise the disruptive potential of an innovation on industries due it might lead into great competitive advantage in it's markets. Keeping in mind that most innovation frameworks focus on technical, commercial and organisational implications of radical technology, and fail to address the difficulties of appeasing varying, changing and often contradictory secondary stakeholder demands (J. Hall et al., 2005).



*Fig. 6: Disruptive Technologies: Stake holder and the innovation added chain*

Source: J. Hall, (2014)

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**It is found** important for innovative companies to not only address the existing needs of the markets but also concentrate on the latent ones (Zakić et al., 2008). According to a study conducted among four processes oriented companies - most of the early stage ideas for innovations arise from customers needs (M. Kurkkio, 2009). Customer needs have been noted in business and research literature and one important approach is to find out not only customers current but also their latent needs (Zakić et al., 2008).

**According** to a study about how to manage radical innovations written by Robert Stringer (2000) and published in the California Management Review - the organisation size correlates clearly to the amount of radical innovations undertaken in the company. Big organisations are created to establish a status quo and not to spun radical innovation. They lack tools and methods, innovation management, culture and personnel for enhancing and nurturing radical innovations. This makes collecting the radical innovations from the front end of the innovation process difficult for traditional companies (R. Stinger, 2000).

**The SME's** have played a big role in creation of radical innovations compared to big more established corporations. Small enterprises supported by venture capital have produced six times more patents compared to traditional enterprises during 1965-92 in the U.S according to a study conducted in 20 industries by Harvard and Boston universities (R. Stinger, 2000).

**Stringer (2000)** also stated that there are problems for traditional companies in utilising the potential found to revolve around radical innovations. There are four reasons defined for these problems in traditional companies:

1. **Firstly** industry leaders cannot afford being the first ones in the markets with a new product. They have a lot invested in long-term innovations that produce incremental changes to the existing product portfolio. The problem for traditional enterprises is in the locating of radical innovations. Even in case they are located the reallocating of resources for a radical innovation might be too slow.
2. **Secondly** large scale usually brings bureaucracy and this way slows down the decision making which might be discouraging for bringing radical innovations to the market. Large-scale companies also have created cultures that enhance status quo instead of disruptive innovations.
3. **Thirdly** the evaluation of radical innovations and success calculation might fail in larger companies as the same indicators for success are used for both, incremental and radical innovations. Radical innovation might take longer time to be adopted by the markets and might not lead into short-term profit as fast as incremental innovations. However the long-term profitability is seen as an advantage in disruptive, radical innovations
4. **Fourthly** Stringer (2000) claims that it is possible that the profile of an innovative person does not necessarily fit into the culture of large company. Smaller companies offer more opportunities for innovative individuals to satisfy their needs for achievements (R. Stinger, 2000). Thus it is studied that innovators are idiosyncratic and they tend to defy aggregation - the attempt to profile the typical innovator is very difficult (G. Segal et al., 2005).

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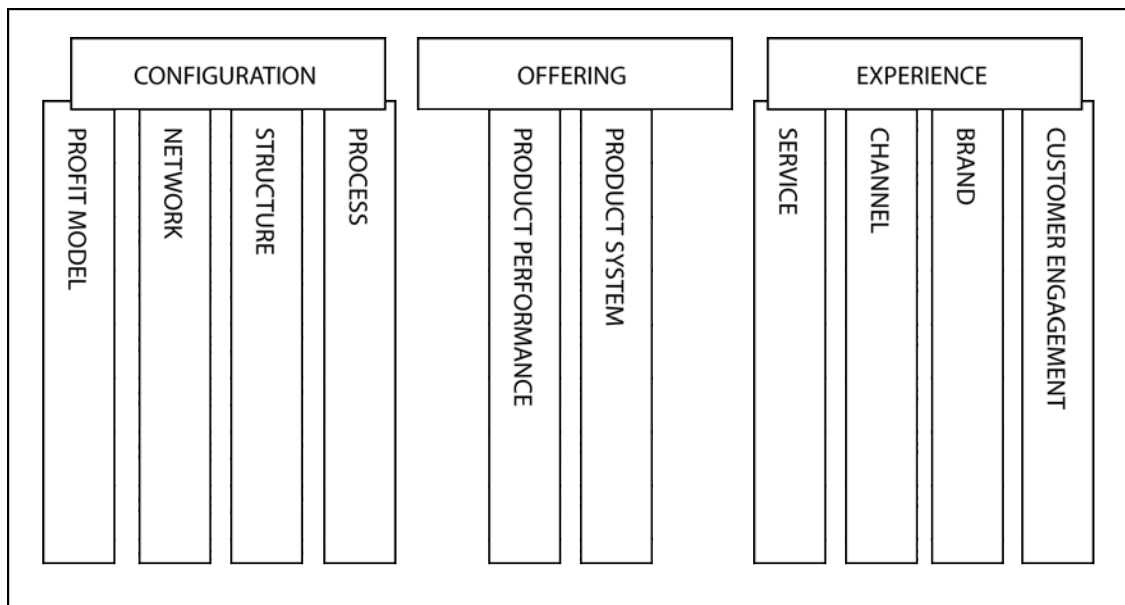
## **Innovation management**

**Innovation management and innovations in companies are traditionally generalised into two categories.**

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**Firstly** the innovations that are business model related and secondly innovations done in the product and service portfolio (E. Bucherer et al., 2012). This generalisation still exists but it is suggested that more holistic approach to the already existing and established best practises in Innovation Management should be considered. In this more holistic approach the different categories of innovations (product/service, business model) and different degrees of innovations (incremental, radical) should be more integrated.

**In a book** “Ten Types of Innovation: the discipline of building breakthroughs”, Larry Keeley et al. (2013) gave ten definitions for innovations undertaken in companies. These ten types were separated into three categories. Firstly the innovations undertaken in the fundamental strategies of the organization are referred to as the configurations. Second types of innovations were the core offerings such as products and services offered by the organization. Thirdly the innovations conducted in the experience or so called surface that is visible for the customer. In he figure bellow my reader can see the ten different definitions for innovations stated by Keeley et.al. (2013) (L. Keeley et.al. 2013)



*Fig. 7: Ten types of innovations*

Source: Larry Keeley, 2013

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**The separation** of business model related innovations and innovations in the category of product and service innovation should also be done between service and product innovations. There is a consensus in understanding of the key differences between tangible product innovations and intangible innovations done in service sector. Still these two are mainly tied together in the extant innovation literature (I. Alam, 2005). Understanding the difference between these two categories is important thus creating a three category model for innovations could be recommended. In this thesis however there exists only two categories - as this is the way most of the extant innovation expresses the category of innovations.

A large body of work have been concerning the best practises for new product development. In the extent innovation and NPD literature different success factors have been identified for successful NPD processes. Management support was stated to be highly important success factor for a product/service NPD process according to Christoph Lock (2000). In Locks' study he compared numerous previously conducted studies from the field of innovation management (Montoya-Weiss and Cantalone, 1994; Brown and Eisenhardt, 1995; Cooper and Kleinschmidt, 1995) (C. Lock, 2000). Later study conducted by Eva Bucherer et al. (2012) how ever states that in contrast to product innovation, where the process involves different hierarchical levels, business model innovation is mostly performed under a top-down approach (E. Bucher et al., 2012).

The current approaches to the analyses conducted in companies are highly dependent on the CEO and top management (E. Bucher et al., 2012). A conclusion from this can be drawn that all in all innovation management in different categories and different degrees need support from the top management level of the company.

Also innovations made in the business model category offer greater impact on opportunity findings for companies compared to the ones offered by innovations in the product/service category. This is due to the fact that innovations made in the business model category allow more comprehensive differentiation from the competition and broader effects on the company's top and bottom line (E. Bucher et al., 2012).

As stated by E. Bucher et al. (2000) In a study conducted by IBM (2008), 98% of the CEOs interviewed stated that their company would undertake extensive or moderate business model innovation within the following three years (E. Bucher et al., 2012).

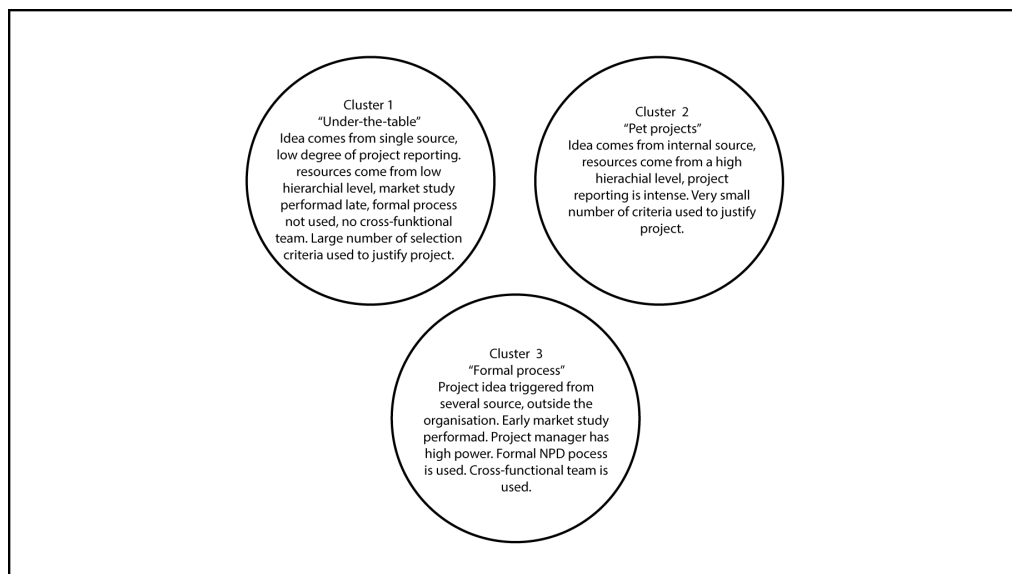
The reason given for this by the interviewees was the increasing difficulty of differentiating from the competition with only product/service innovations. It is said that as product/service models can easily be copied, with innovations made in the business model category the companies can change the way business is conducted. Business model innovations are said to be difficult to copy due to the fact that they have to fit companies' long-term strategy, corporate culture and core competences (E. Bucher et al., 2012). Also in a study made by Eurostat In 2010-2012, enterprises reporting organisation and/or marketing innovations were slightly dominant (37.1%) in the EU, compared with 36.0% of innovative enterprises for products and processes (Eurostat, 2012).



**Chesbroughs' (2010)** research also claims that business model innovations – so called process innovations are more and more important for companies in order to achieve long-term success. He also stated that a mediocre technology pursued within a great business model may be more valuable than a great technology exploited via a mediocre business model and that the barriers for changing business models are difficult for companies due to the fact that the organisational processes must also change.

Affordable loss is expected when business model experimentation takes place within a company. This is predictable but it should also be encouraged due to its value for learning organisation. Chesbrough (2010) claims that the root of the problems is in the exploitation of radical innovations by using existing business models. In radical innovations the companies easily tend to utilise existing business models to commercialise their radical offerings. Chesbrough (2010) says that the root of the tension is that old business models are used for the emerging new technologies (Chesbrough, 2010).

According to a study conducted by Lock (2000) among product development teams creating new innovations from a large sized technology company - there are three major clusters that can be identified within companies creating new innovations. These clusters are defined by the management support, origin of their idea and their process structure. In the figure below one can distinguish more detailed explanation for these clusters – but in general the first cluster is so called "under the table" where the project is conducted in rather secret conditions within the organisation (Low level of reporting). Second cluster however is somewhat contradictory due to its high level of reporting conducted to a management level employee. The third cluster then follows the more formal process created in the company for innovations.



*Fig. 8: NPD Process Clusters*

Source: Christoph Lock, 2000

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## **Front end of innovations**

The success of product development processes is highly influenced by uncertainty and difficulties in forecasting the future.

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**Reducing unnecessary** uncertainty from the process increases the probabilities of the successful project (Smith et al. 1999). This sort of uncertainty can be found in the product/service innovation dimension as well as in the business model innovation process. As it is difficult to forecast the success of a product it is as difficult to forecast the success in marketing it. Especially effecting factor of forecasting innovations future success is the level of its innovation - the level of newness of the new innovation makes this forecast even more difficult.

The front end of innovation processes have been stated to have characteristics of uncertainty due to their unstructured form when compared to a more organised later steps of the innovation cycle such as in the Stage-Gate model. This uncertainty has been described as the inability to assign out-comes or probabilities for processes. According to Smith et al. (1999) the activities undertaken in the front end are supposed to reduce this uncertainty and ambiguity. (H. Nordlund, 2009)

In existing literature the early stage of innovation process has been called either “the front end of innovation (FEI)” or “the fuzzy front end of innovations (FEE)”. For example in research conducted by Kurkkio et al. (2011) – the term FEE is used to describe the early stage of innovation process contrary to the term FEI used by Koen (2014). In this literature review the term FEE is changed into FEI to bring clarity between this polarised terming.

The FEI of product development has been conceptualised several times in the literature by Cooper (2008), Griffith-Hemans and Grover (2006) for example. These concepts mostly focus on ideation screening of ideas and the creation of a product concept while some of the studies also take a broader perspective and explore the whole FEI and identify general success factors at the front-end (M. Kurkkio, 2011). In a study conducted by M. Kurkkio (2011) process firms were interviewed about their innovation processes and specifically their front-end activities of innovation processes. The interviewee group in this research consisted 64 employees from different sectors of the companies.

M. Kurkkio (2011) claims that most of the existing research in the front end of innovations has been conducted in the sector of assembled product development. Assembled product development in Kurkkios’ (2011) study points to products that have been assembled by a company by using multiple components provided by multiple suppliers. Kurkkios’ (2011) research has done focuses on the supplier firms, so called process firm's innovation processes. Kurkkio claims that to increase the understanding of the FEI, more research is needed on innovations other than assembled product development, as the existing knowledge is still limited. Also stated by S. Hüsigg et al. (2003):

“...A broader view through interdisciplinary research could be beneficial. The examination of interconnections and similarities between the FEI and other research fields could help to further improve the FEI efficiency and effectiveness...” (Hüsigg et al. 2003)

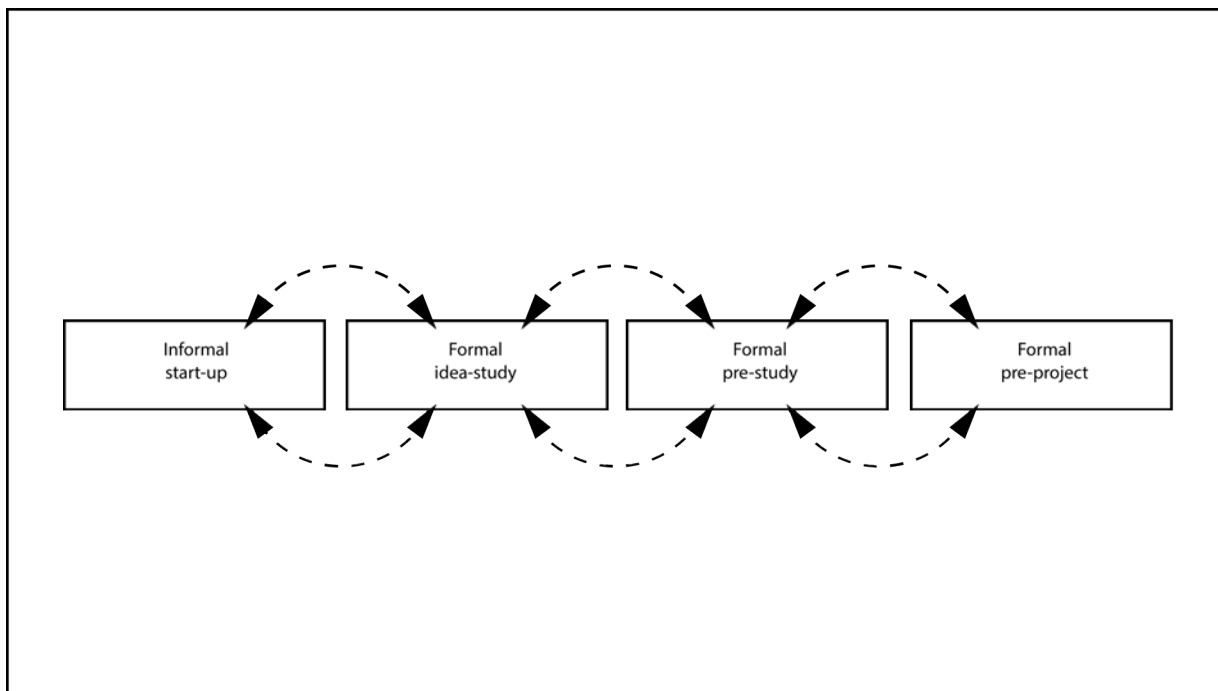
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**In M. Kurkkios (2011)** study the literature review and the basis of the study mainly focuses on research conducted in the field of assembled product development in contrast to the research itself, which has been conducted in the field of process production. This assumedly can be seen as a limitation of the research.

In Kurkkios (2011) research the FEI in non-assembled product development was divided into three sub-phases:

1. Informal start-up
2. Formal idea-study
3. Formal pre-development study

The starting point of the innovation process was the idea. According to Kurkkio (2011) this idea typically came from the customer or from internal development personnel. The ending point of the sub process FEI in the overall product development process was the decision to create a product concept and to proceed with the formal development or not. Usually the next step after moving to the formal process was to validate the scalability of the project.



*Fig. 9: The FEI in Process Development*

Source: M. Kurkkio, 2011

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**Kurkkio et al. (2011)** explains that the respondents in their study suggest that early involvement of production staff; cross-functional collaboration and a creative culture are key aspects to support activities in the FEI. Keeping in mind that the research Kurkkio et al. (2011) conducted is focused on the front-end activities taking place in process-oriented firms. As suggested by the authors - the study might not be relevant in other industries due to the fact it was conducted in process companies that were all active in the metal and mining industries.

**In a research** conducted concerning integrating Technology Road-Mapping and Portfolio Management into the front end of NPD - Oliveira et al. (2010) came to a conclusion that it is challenging for companies working with NPD processes to manage the front end of innovations. Oliveira et al. (2010) state that it is critical to come up with new appropriate theories and proposals that support the successful front end of innovations (Oliveira et al., 2010).

Cooper (1990) also stated:

*"The front end of the innovation process defines the success of the NPD process in terms of competitive outcomes and performance. The most pivotal activities- those in which the differences between successes and failures were the greatest - were the early activities in the new product process. "* (Cooper, 1990)

If a company is ineffective in the front end of the NPD process there is a high probability of product failure in terms of financial returns, strategic and commercial expectations, even though the technical development of the company would be high (Cooper, 1990).

According to Jongbae et al. (2002) It has been seen several times that companies capable of creating well working management models and frameworks around the front end of innovations are more likely to win the innovation race – in other words be more successful than their competitors. Unfortunately only a few companies understand the importance of the FEI phase, despite the clear impact of managing this part of the innovation process has to the success of the overall NPD process. The management frameworks for managing the FEI can become an important advantage and even a core competency in achieving companies' innovation strategies.

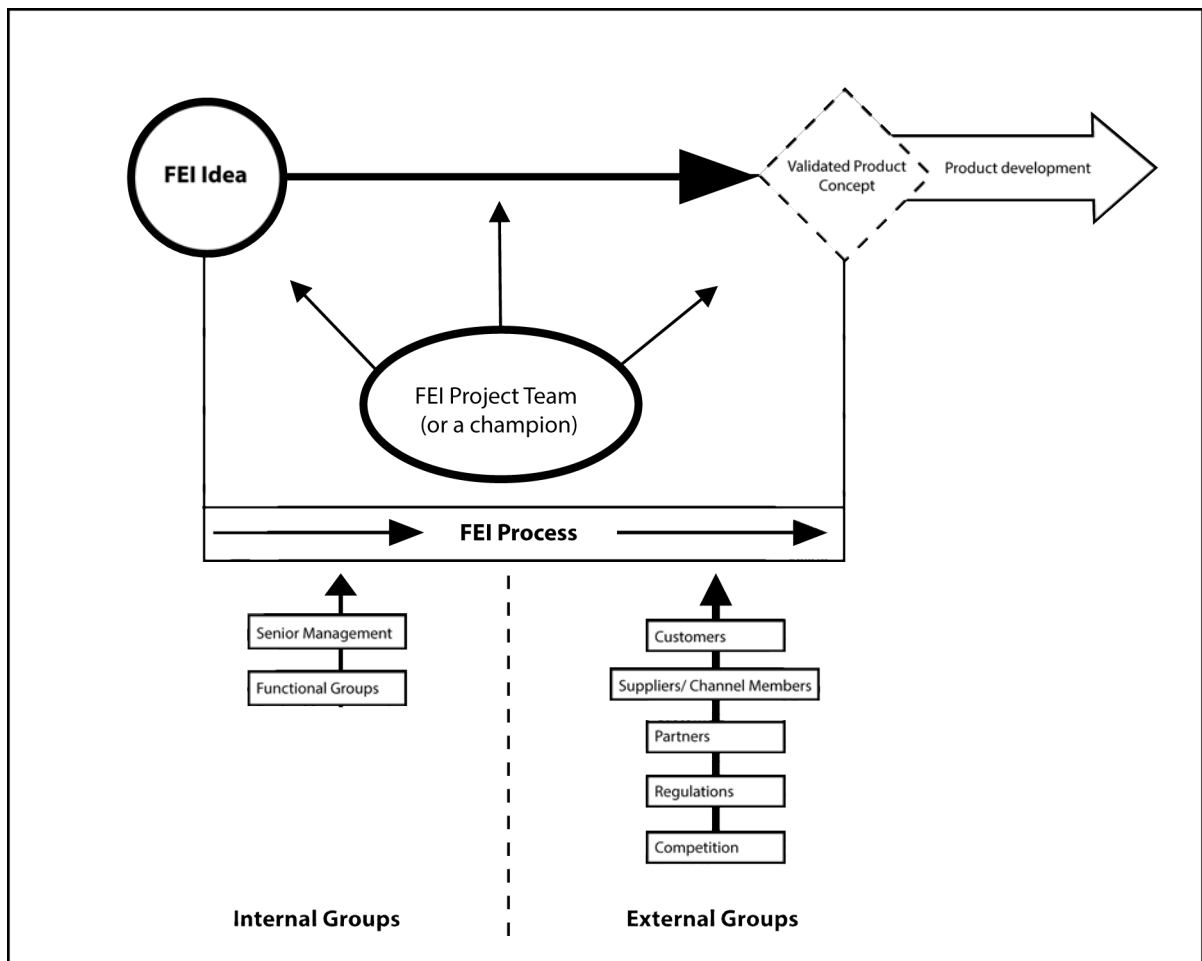
Asking critical questions about the way strategies and management frameworks are used and controlled in companies could make it easier to understand the key activities in the FEI. In a research conducted by Jongbae et al. (2002) they listed critical questions that should be addressed in order to capture the best ideas from the front end into further process development.

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*Critical questions  
concerning the front  
end of innovations:*

- **What activities must be accomplished in the FEI?**
- **What skills and experiences are required by those involved?**
- **What is the FEI project leaders role?**
- **What are the responsibilities of the senior management?**
- **What is the best way to motivate FEI project teams for high FEI performance?**
- **How can FEI project teams gain the cooperation and support of functional groups and garner management support?**
- **What contribution can an innovation network or alliance offer?**

**Jongbae et al. (2002)** have distinguished that two major factors affect the performance level of the FEI process. These factors are the FEI project or the idea itself and the second is the team, the champion or the individuals working around the project. Also said that the first step towards assigning FEI performance is to assign competent people to work in the process. Jongbae et al. (2002) also identified that internal and external groups that are shown in the figure below affect the overall FEI process.



*Fig. 10: Framework of major factors influencing FEI performance*

Source: Jongbae (2002)

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## Summary of the theoretical frame

The literature review works as the theoretical basis for this research and gives the study a way of analysing the outcomes in a setting and a context of new product development.

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**The theoretical frame** contained theories about New Product development and technical ways that these NPD processes are conducted in organisations. One of the major topics in this part of the literature review was the exploration of the Stage Gate model, system or a process introduced by Robert Cooper (1990). The Stage gate system works as an example of a structure that is often used in organisations.

**Usually** when talking about NPD - the degree of innovation is discussed. In this research the radical and incremental innovations and their role for organisations innovation capabilities are also taken into consideration. When discussing the activities in the FEI of organisations it's important to know what is the goal for these activities. In other words it's important to know where the organisations are heading with their innovation strategies.

The way strategies are utilized in the organisations can be understood by studying the organisations innovation management. What innovation management frameworks are in use defines how ideas are moved forward and what is the attitude towards new ideas.

In this research all the latter mentioned information crystallises into understanding the activities that happen in the front end of innovations. This stage before formal processes is not very well known topic but appears to be very important to understand as it creates the fundamentals for the next steps in the organisations innovation process.

**The field of application** for the outcomes of this research will be in the innovation management and specifically management that take place during the front end activities. This is the reason why the literature review generates a general understanding of the existing formal models of innovation management.



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# **METHODOLOGY AND RESEARCH** **QUESTIONS**

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# Methodology

**The need** for planning a research ahead of its' existence is important in order to gain well-structured data. This helps the researcher to understand the phenomena that is under investigation. In this study the phenomena is a comparison of activities taking place in the front-end of companies and research organisations innovation processes. This knowledge is gathered by interviewing experts from selected case organisation.

**The interviews** conducted among selected experts from the field of this research are undertaken in a form of semi-structured interview. The interviews are formed into theme interviews that give more space to the interviewee to interpret and use their own terminology. The theme interview means that all the interviews have the same fundamental questions but the order and structure of the interviews may vary according to the needs and interests of the interviewees.

**As clarified by H. Nordlund (2009):** "Theme interview proceeds with the help of themes rather than specific questions concentrating on the subjective experiences of a certain situation or process." As all the interviewees are individuals working in separate projects with their own tools I encourage them to use their own language and concepts to describe their work and approach with respect to the front end of innovation processes and activities. As stated by Nordlund (2009) the FEI is relatively little studied field and understanding the topic and naming processes used in the FEI can cause problems in data collection.

**The interviews** were conducted in companies and research organisations in Finland, Switzerland, China and US. The sample is international and the interviews were conducted in English or in Finnish language. The sample will be collected into two comparable groups. The interviews conducted in the first group range from private sector company representatives focusing in R&D and the second group of interviews will be conducted in public sector research organisations and their R&D.

**The three level categorisation** of innovation processes or so called "NPD Process Clusters" defined by Lock (2000) shows that getting most information, not only considering the successful innovation processes, but also failed ones might require knowledge from personnel responsible for "pet-projects" and "under the table-projects" as these projects seem to have little formal reporting responsibilities in the innovation process (C. Lock, 2000). This might lead into difficulties acquiring data from other sources but the employees working very close to these processes and projects in the companies and organisations.

**Assumable management** level employees that have responsibilities in the success of innovation processes play a significant role in this study. By making the same assumption about the interviewees in my sample of case companies and organisations helps me to avoid possible biases in this specific point of the research.

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# Collecting data

**Understanding** the nature of collected data from the selected sample as well as the selected population is important. This is one reason why it should be underlined that in this research the collected data from the selected case studies will be retrospective. My approach to the projects is an outsider point-of-view and a narrow view into what actually happens within the FEI of a particular project. This is why the collecting of the data is to be clearly defined into a way that enables finding the most valuable information.

**Interview questions** structured by earlier researchers collecting data by using semi-structured interviews about the front end of innovations have been built into three or four question sets. (Nordlund, 2009; Kurkkio et al. 2011) These sets have their themes that structured the interview. The sets have been structured for example in a following order.

**Firstly** questions about the interviewees' background and position in the company or organisation are asked to make clear the interviewees relevance and input to the collected data set. Secondly questions about the current use of innovation management practices in the company or organisation are asked to find out the information that later on creates the comparable data set. Thirdly the interviewee is asked to describe a case study to clarify a context for the innovation.

**Collected** data from the previous question block will be used to find out the specific innovation frameworks used in the case study at hand. Lastly questions about the future development of the innovation frameworks in the company or organisation are asked to also measure different development goals in the companies and organisations.

**The way** the questions are set have an impact on the answers received from the interviewees and problems caused by leading the discussion with bias questions should be avoided during collecting information.

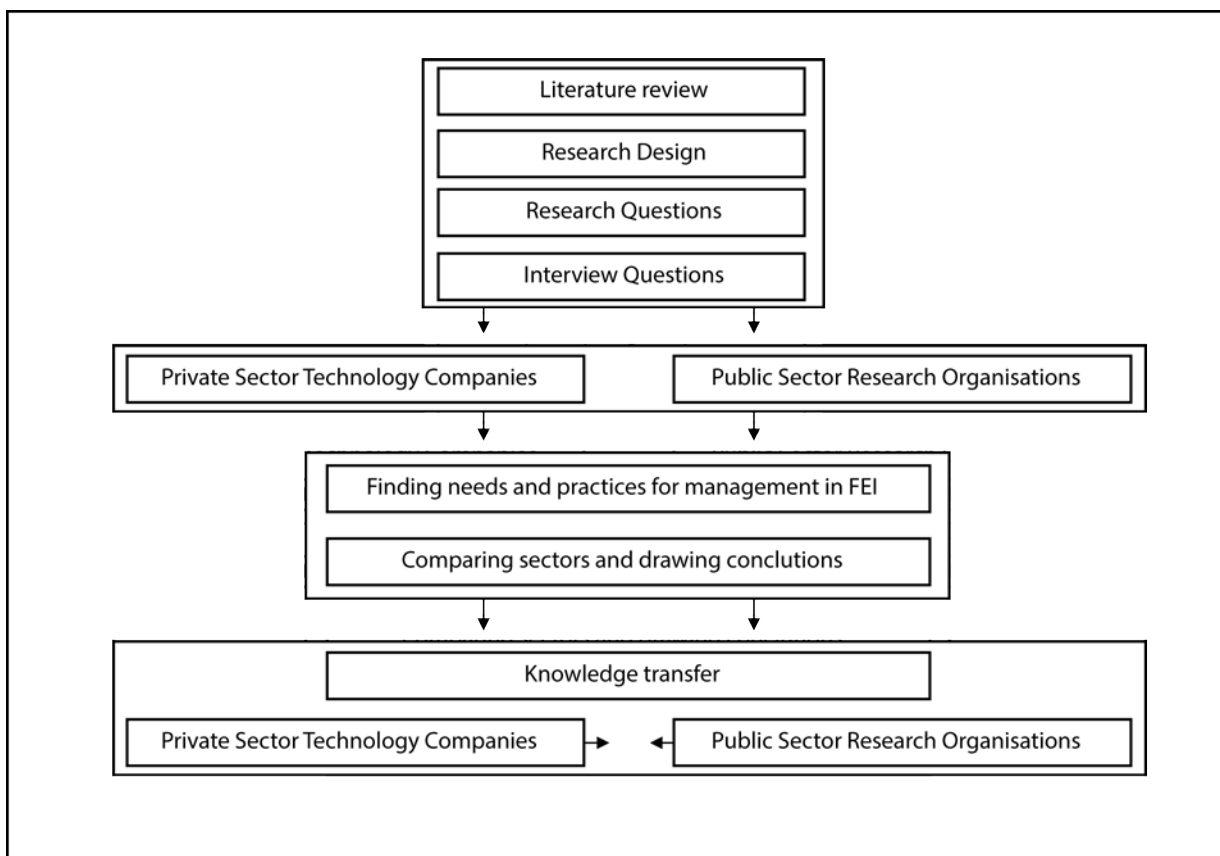
**Much** consideration in data collection with qualitative methodologies has encouraged self-reflectivity during the process. What is my role as a researcher in the discussion and which topics remain un-discussed or are given too much attention during the data collection are questions that have to be addressed as well. As defined by Nordlund (2009) the researchers cannot capture the lived experience, but rather the researcher with the text that is written creates the lived experience. This leads to the idea that the researcher can no longer hide behind neutrality – but should understand that as not being an external object but an active constructor of meanings. (H. Nordlund, 2009)

**As mentioned before** - the qualitative data used in this research is collected from experts working in private sector technology oriented companies and public sector research organisations. The data is gathered by using qualitative methods. After the data was collected

it was structured into themes and is coded into blocks according the answers they provide to selected questions. These codes are analysed and conclusions are drawn.

## Research process

**The research** can be understood as an iterative process as the understanding of the possible answers to the research questions and amount of collected data correlate to each other. As the **research** is on going the leanings about better approaches to topics and interviews are adopted to the methodology. In the figure bellow the process for this research is divided into a few steps. These steps start from the preliminary information collecting in the literature review and end into the reporting of the final outcome. In between the steps include planning the research, carrying out the interviews, data coding and analysing the data for final conclusions.



*Fig. 11: Structure of the research*

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## **Multiple case study research design**

**“...Multiple case studies are a variant that includes two or more observations of the same phenomenon...”**

**(F. Santos et.al. 2015).**

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**In this research** the phenomenon is the activity that has been conducted in the front end of innovation process in selected companies and research organisations. The Multiple Case Study Research Design (MCSR) of this research is divided into two different phases. As the research relies on data collected with semi structured theme interviews conducted among experts. Firstly the selection of the cases and the design of the data collection method are defined. This part is assigned to the “Research design” found from the figure above. The case selection is structured into two steps where the first step is the selection of the private sector technology companies and the public sector research organisations. These are treated as so called general cases that are used as background information regarding the overall innovation capabilities of the companies and organisations. The second step is the selection of individual cases within the companies or organisations. The experts from the case organisations propose the cases during the interviews.

**This two-step case selection** gives a wider view on the companies and organisation innovation processes and puts the interviewee into situation of more personal approach to the topic. Some of the second step cases are ones where the interviewee has been involved in the innovation process. This will also reduce the possible limitation of being given only general information about the companies’ innovation strategy, which might not be used in practice. Also the difficulty for companies to define their innovation supporting activities in the FEI stage of innovation in a formal setup might lead into not receiving enough relevant information regarding to a particular stage. Asking the interviewee to define a process where all the innovation stages between the idea-to-launch have taken place. This gives a deeper understanding about the practise of innovations in the organisation or company. In the table below the reader can see the steps that were taken during the research concerning data. This data collection is defined as the first step of data in the table. The table consists from all the required steps for the process, their objectives and methods used for achieving the information. The last step in the table defines the outcome of this research. In this step the collected data is interpreted into a comparable form where one can analyse the differences – and similarities of the acquired data. Conducting a cross-case analysis among the cases does this.

Step of data	Objective	Method used
Collecting data	Gaining detailed information about the experts knowledge in the field of FEI	Semi-structured theme interviews
Getting familiar with the data	Finding out a specific theme to better understand causalities behind the collected data	Returning to the interview recordings and transcribes
Analysis of individual cases	Interpreting data and comparing the case with organisations overall innovation capabilities	Clustering data into more specific themes
Analysis of the overall phenomena	Comparing the cases within sectors and comparing phenomena across sectors	Cross-case analysis

*Table 2: Steps of data in the research*

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# Research questions

**Companies use different sets of tools and frameworks to control and predict their innovation processes.**

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**As stated** by numerous researchers, the front-end section of the innovation process where the preliminary ideas are created has become more and more interesting studied topic (H.Nordlund, 2010; R. Cooper, 1990; M. Kurkkio, 2011).

**What tools** and methods do product development oriented technology companies and research organisations use for managing the front end of innovations? How do they capture the best ideas from the front end of innovation process for further development? What do these companies and organisations do to ensure they capture the most essential and beneficial ideas when they are born, and push them forward into the pipeline of innovations? These questions have been answered in many fields of application and industries (M. Kurkkio, 2011; H. Nordlund, 2009; Koen et al. 2001) yet still numerous questions remain unanswered.

**The basis** for my research lays in understanding the tools and frameworks used in two separate sectors – the private and the public one, and the outcome is comparable information gathered after understanding the differences and mutual benefits that these two sectors share in the context of front end of innovations. After understanding these benefits a knowledge transfer strategy or framework enables the solutions to diffuse into these sectors. The primary question set for each of these sectors is: “can best practices be found for controlling the front end processes and to ensure that the best ideas see the daylight in the organisation?” The question set to them as a symbiotic pair is: “what can private sector technology product development oriented companies and public sector research organisations learn from their FEI processes and how could these learning’s be transferred from one organisation to another?”

- 1. How do private sector corporations and public sector research organisations manage their FEI processes?**
- 2. What are the best practices for the successful exploitation of FEI in these organisations?**
- 3. How can the knowledge be transferred among these organisations?**

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# Case descriptions from Private Sector Companies

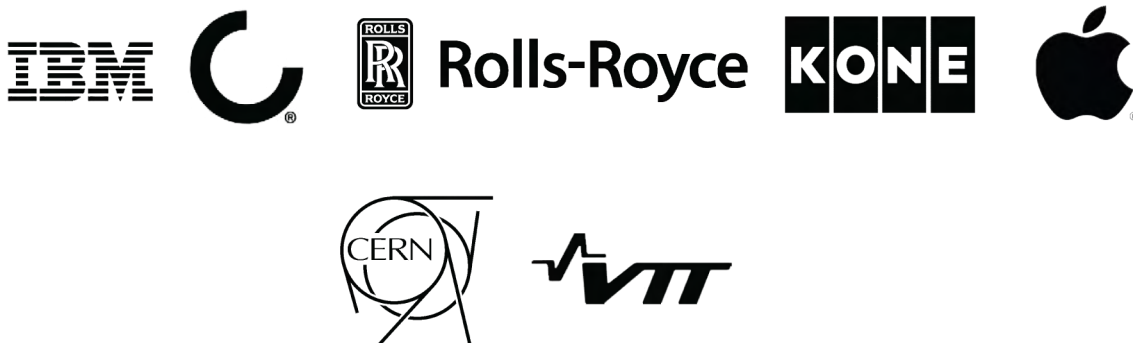
**All the interviewed companies have international activities and they are well established on global scale.**

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**Also** their innovation strategy involves innovation all around the world and all employees were actively involved in the FEI activities. However the level and method of involvement varies from company to company.

**These** are findings collected from expert interviews among management level in the case companies and the opinion of involvement might vary according and among employees themselves. The case companies differ in size but other significant similarities are easy to distinguish. All the companies are working with innovation processes and activities in the field of technology. From five companies – four are working with business-to-business markets and one is manufacturer and distributor of consumer electronics. Innovations are found to be important in order to maintain the success in future business development in companies. All companies have established their own methods for finding new ideas and creating new innovations.

**None** of the case companies shared same processes for FEI but similarities among them could be found. Also similarities can be distinguished. Almost all of the companies were using an online platform for capturing ideas for further development.



*Fig. 12: Case companies and organisations logos*



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## **Revenue allocation in the Private sector companies**

In this section we are looking at the key figures collected from the companies. The companies can easily be placed into an order according to their research and development investments during the year 2014.

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**Essentially** the R&D expense figure displayed in an annual report is the amount of money that a company spends to develop new products and services each year. Like marketing expenses, but unlike capital expenditures, R&D expenses are subtracted from revenues every year directly. Therefore, accountants treat R&D spending as an expense rather than as an investment, though there is continuous debate over whether this is the correct classification. This information is compared in some extent among the sample of case companies. The figures should be calculated in a comparison between past investments. The highest growth in R&D investments may indicate greater change in the companies' innovation strategy.

**The information** about the R&D expense is not easily accessible and requires calculations undertaken by the researcher. This may cause an error in the real figures and should only be taken as guiding information about the direction in which revenue allocation in the case companies might be heading to. When discussing companies R&D – the level of investment should be taken into consideration. For example - is the R&D expense used for buying assets that can be determined as sunk or fixed costs or are the expenses invested into new machinery that have stronger ROI value? Determining the answer to this question can have a significant impact on how the company is valued.

**The valuation** about the companies R&D expenses are only used to give an overview about the selected case companies and to put them into a rough order according to their figures. Also some comparison between the companies' innovativeness and use of FEI tools can be drawn according to how much is used on R&D. Also comparison between how many ideas are presented in the FEI and how many of these ideas are actually taken forward in to the formal process of innovation and the amount used in R&D might have a minor correlation.

Company	Revenue allocated to R&D 2014 %	Change from 2013 % & capital change %	R&D expense €/ \$ 2014
Apple	3,00%	+/-0,0% & +35%	\$6,014 million
IBM	5,85%	+0,02% & -6%	\$5,437 million
Rolls-Royce	6,20%	+1,2% & +15%	\$860 million
KONE	1.40%	+/-0% & +9,35%	€103.1 million
Konecranes	1,40%	+0,2% & +12,8%	€28.9 million

*Table 3: Revenue used for R&D in case companies*

Sources: [www.investor.apple.com](http://www.investor.apple.com), retrieved 21.5.2013; IBM Report of Financials 2014; RR Full Financial Statements, 2014; KONE-interim-report-2014-Q4-presentation; Konecranes Annual Report, 2014

**I asked** the experts to give an estimate about the amount of ideas produced by the company yearly compared to the amount of ideas actually implemented into existing products, services or processes. The question was difficult for all the experts as they did not have the opportunity to find the information but they had to give the estimate by “shooting from the hip”.

**The estimates** most likely differ from the real numbers but interesting enough - was to know how well the management level employees had been informed about the front end activities within the company. Finding out how many ideas the company produced and how many of these ideas actually found their way into execution - would at least be relevant. As an idea creator would be interesting to know the estimated impact of one given idea within portfolio of ideas. Some rough estimations and generalisations have been given about the amounts of companies' idea to project values but they seem rather unreliable from a scientific perspective. For example Schilling (2013) gives an estimation that states that from 3000 raw unwritten ideas - 300 are submitted into a system – from which one is turned into a successful new product (M.Schilling 2013). This estimate is extremely vague and doesn't take into account incremental changes in the existing products for example.

**The size** of a company has stated to have an impact to the companies innovation capabilities. It has been debated for 50 years whether this impact actually exists or not. Size brings advantages like economies of scale in R&D, access to complementary resources and marketplace or capital. Disadvantages have been said to relate to the difficulties in governance. Structural dimensions of the firm like formalisation, standardisation and centralisation normally enhance efficiency but tend to also affect experimentation and creativity in a negative way. Companies have ways to control the negative effects of size and speed of expanding by cutting the organisation into smaller fragments or divisions. These divisions can behave like more entrepreneurial firms (M.Schilling, 2013). In one of the case companies the expansion of the company was seen as a treat to the existing culture that was said to be very supporting for creativity and experimentation at the moment of interview.

Company	Case	Interviewee
1. IBM	1. IfundIT	1. Innovation Program Manager 2. Innovation Director
2. KONE	2. Innovation Tool	Design Manager
3. Rolls-Royce	3. Innovation Port	Operations Manager
4. Konecranes	4. Business Factory	Innovation Manager
5. Apple	5. Community Interaction	Design Manager

*Table 4: List of companies and case projects in order of interviews*

Case	Description / Code
<p>Case 1.</p> <p>IBM / IfundIT</p>	<p><b>Enablers:</b> ifundIT was created in 2012 following a similar existing platform called Think Place, which was created in 2005. The ideas added to Think Place were usually local and incremental. Difficulties were seen with gaining feedback for one's ideas for example. The reasons for moving from Think Place to ifundIT were the problematic with adding ideas into the system without having to work on the idea afterwards. When the Think Place was in use the daily ideation and the think place splintered into numerous small digital communities within the case company.</p> <p><b>Origin of the idea development:</b> ifundIT fundamental idea relies on crowd funding where the employee can submit a project description video into an online platform. Then other employees are allowed to offer resources and funding for these projects and if the project is sufficiently funded it will automatically move into product development. The first iteration of the platform was created in the case company's research organisation and it was originally named 1x5.</p> <p><b>Target:</b> The fundamental idea of the platform is that one is able to follow a submitted project from beginning to the goal and this might even become one's new job. This supports the target of gaining the entrepreneurial mind set in the organisation. It is said to be important to motivate employees and encourage them to do ideation. Reenergising the community seems to work as a slogan for the development. The formal Stage Gate systems were seen insufficient. The case company does not use stage gate model as an innovation process. A pragmatic reason for this is that evaluating ideas in gates would have been a full time job for some team. These employees would most likely have done this against their own will and might not have any competence to validate the ideas.</p> <p><b>Supportive activities:</b> A patent awarding system is in use in the case company. Patenting is said to exist very deep in case company's culture. If an employee has a lot of patents he can be awarded with a "Master Innovator" title in the company. Also a higher status title called "fellow" is awarded to innovative employees. There are around 250 of them from around 60 in the house.</p> <p><b>Internal radicalness:</b> Supportive platforms for ideation did exist already before the creation of the IfundIT. However in these employees could create innovations in their own time. The IfundIT platform gives funding available for employees. The peer employees make all the decisions about ideas transferred into projects.</p> <p><b>Impact:</b> The shift in culture towards more entrepreneurial like environment where freedom for ideation is enhanced. We have lost also in IBM this Skunk Works attitude. We have gained some of it back lately.</p> <p><b>Life cycle:</b> A pilot program was then done within the CIO organisation (around 5000 people) to see how the IfundIT platform works. In this trial there were around 350 people working as investors. This was successful so the platform was scaled to all organisations 400 000 employees. The idea will be sold to other companies. In the first iteration conducted by the research everyone acted as an investor. This was changed when the system was scaled into a global version. It could be done also now but the amount of money for each investor would be quite small due there are now around 7000 investors active in the platform.</p>

	<p><b>Responsible instance in the company:</b> CIO function called the “CIO lab” coordinates programs created for these kinds of needs. Usually in these projects the IT is usually in the focus. CIO's contribute to the IBM innovation capabilities and in the CIO function the idea was evaluated from the IBM research. The program started as a research project named “1x5” and changed in to ifundIT when moved under CIO function.</p> <p><b>Level of openness:</b> The platform is internally and globally open for anyone. In this way everyone is equal in the adding of the ideas. The system is not open for external parties.</p> <p><b>Challenges:</b> All the innovation resources might not spread around equally with in the company due there is no product development activities in all case company facilities. Creating new ideas away from the headquarters can create a feeling that the contribution is small. The corporation builds products to the shelf to sell and then the distant facilities sell them locally. It makes the idea of creating an innovation far from the headquarters that could contribute the whole company quite difficult. The idea for the platform can divide that executive level in the case company. Some were thinking that a program was in making where anyone can submit projects and anyone can join them. Problematic with this could be that the employees are not doing their jobs then. On the other hand exactly this was the reason why it was seen as an opportunity. There is some bureaucracy that can cause difficulties and require some stamina from the creators of the platform but the platform has the support from the senior management after all.</p> <p><b>Output:</b> The important effect is also that the ifundIT makes funding available. After a successful funding the given money funded can be assigned for paying other people to do the work for the project. The funders in the system are assigned so that the amount of investors follows the demographics of the company. The system automatically checks if they are allowed to sign up or not and put on a waiting list.</p> <p><b>Structure of the platform:</b> The platform is an online-based system where employee can freely submit an idea for a project in video format. The idea creator gives additional information regarding the needed resources such as intelligence or monetary support. After submission - other employees can review the projects, discuss them with the idea creator and support them with resources they have. There are volunteer investors who can invest IBM money to the projects they like. Anyone in the company can become an investor but the investor mandates are divided according to the demographics of the company - so that they split equally geographically. There are around 7000 active investors in the platform.</p> <p><b>Roles divided in the organisation:</b> The “Idea creator” submits an idea in video format and requirements for resources. “Idea evaluator” can be any employee in the company. They can support and discuss ideas with the creator of the ideas. “Investors” are selected voluntary employees and they can assign resources for ideas submitted by idea creators. “Idea executor” can be someone else then the idea creator. After successful funding the idea creator can buy the execution from others with the resources assigned by investors.</p> <p><b>Future of the platform:</b> To create a platform that could be specialised for example only for sales department of the company. Or to use the platform not only for building new ideas but also for only gathering ideas. Selling the platform as a product for other large corporations.</p>
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<p>Case 2. KONE / Innovation Tool</p>	<p><b>Enablers:</b> Senior management wanted to enhance innovations.</p> <p><b>Origin of the idea development:</b> Innovation Tool has been developed since 2009. It is still in use in the company. Workshops were used to involve users in the creation of the tool. Quite rarely it was said to be the office or work environment where the new ideas occur. The system was integrated step by step so that a small group used it first and then it was expanded to eventually whole Finland and then the global network. They come in aeroplanes, shower etc. The interviewee didn't know who came up with idea of launching an ideation platform.</p> <p><b>Target:</b> The goal was to gather as many good ideas as possible. The target was to increase our innovation capabilities and to better collaborate globally. Few success cases were displayed where an idea was taken from Finland, found in Italy and then developed in China. Also making the speed faster for idea to launch was one of the targets.</p> <p><b>Supportive activities:</b> Workshops in the early stage of implementation where employees were included. Campaigns for supporting the collecting new ideas. We have newsletters and your personal activity Is sent to you via email.</p> <p><b>Internal radicalness:</b> The platform was quite radical. People were used to doing ideation to their own storage. Many older engineers were questioning the fact that they have to show their ideas to other people saying that they don't want to do this.</p> <p><b>Impact:</b> Of course innovation is in the focus for the company so they want to allocate resources there. We made it to the Forbes list as only elevator company. The ideation in the platform is in the bonus plan for all employees. We want to show that it is part of peoples job to be innovative.</p> <p><b>Life cycle:</b> We had a campaign. A smaller group first and some feedback from there and then we moved it forward. The system was integrated step by step so that a small group used it first and then it was expanded. Eventually whole Finland and then to the global network.</p> <p><b>Responsible instance in the company:</b> A senior manager level employee works as a project coordinator in this process. Then the stirring group also has responsibility. The focus was big for the project.</p> <p><b>Level of openness:</b> The platform is internally and globally open for anyone. In this way everyone is equal in the adding of the ideas. The system is not open for external parties.</p> <p><b>Challenges:</b> Employees are complaining that they don't have enough time to use the platform. The platform is combined from different topics or sections for ideas, which come from companies existing structure. This is dangerous because usually the best ideas [radical] fall somewhere in the between of these sections. Many older engineers were questioning the fact that they have to show their ideas to other people saying that they don't want to do this. Sometimes I feel I'm too busy to actually do my job as a champion. No one does this job full time. It is in my yearly targets and in my bonus plan also. A challenge for the platform was how to keep up the hype around the platform. We have newsletters and your personal activity Is sent to you via email. People get 100 emails per day so the employees might be overloaded with information. People have different skills for</p>
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	<p>articulating their ideas in the platform. The tool does not innovate it's self - It helps innovativeness. The capability of actually creating something extremely new. The more you have middle management the more difficult it becomes.</p> <p><b>Output:</b> If you ask if any radical innovation has come from this platform I would say no. Mostly incremental.</p> <p><b>Structure of the platform:</b> The platform is structured from different topics or sections for ideas, which come from the existing structure from the company. The platform has three stages. Innovation tool is meant for the front end. Some of the ideas are radical and some are incremental this is why they go through different processes. The platform has a discussion forum. The ideas are given different status during the process.</p> <ol style="list-style-type: none"> <li>1. All the ideas in the platform are first given the status “new”</li> <li>2. In case the champion finds the idea good it can be moved to the “process” status.</li> <li>3. When the idea reaches “evaluation” stage the business owner of the sector where the idea is intended will be asked to evaluate the idea.</li> <li>4. After a business owner evaluates the idea it can be moved into “product development”. From the product development the idea can come a part of an existing product or in case the idea is focused into process development it can become so called “change request” for an existing process.</li> <li>5. In the archive the ideas can have two modes: closed means that the idea is archived for an unknown time, “on hold” means that the idea is seen to be viable within a specific time scope [too expensive for existing manufacturing methods etc.]. The archive is systematically opened time to time.</li> </ol> <p><b>Roles divided in the organisation:</b> The platform has three levels of formally created roles. “The users” are the idea creators and they are hoped to join the discussion around ideas actively. “The champions” facilitate and lift good ideas and archive them. “The business owners” are in the stirring group and have the power to allocate resources within the company</p>
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<p>Case 3.</p> <p>Rolls Royce / Innovation Port</p>	<p><b>Enablers:</b> Management is stated not hands on enough to point out needed improvements in the plant. Previously case company other innovation platforms but the problems have been that the response time for ideas as not been quick enough. People feel that they insert ideas but no one is interested in them. This innovative culture disappears fast if this is the case. This is why the ideas are visual and the response time for one idea is one week from the idea owner who the idea is assigned for. In case the employees are told to solve problems they find by them selves they might not want to report needed improvements anymore.</p> <p><b>Origin of the idea development:</b> Originally innovation is top down process but the case company is trying to make this process bottom up.</p> <p><b>Target:</b> In all organisational levels the case company has a system called OFI (Opportunity for Improvement). The target is that every month one should have one idea and present it forward.</p> <p><b>Supportive activities:</b> The case company has a writing board in the workshop and all the ideas are listed there before submitting to the global system. Every morning the employees have a 20 min meeting in front of the board in the plant. In this meeting all the supportive functions will be standing next to the board. In this meeting the ideas will be read trough and a decision is made who will work the idea given and to find a solution to the presented issue. The next day the idea owner whom the idea was assigned for – will propose future actions for the idea. These are either that the idea can be closed [solved] or it should be taken forward. Normally employees have a quick decision in front of the board during the meeting what are the needed actions. The project owner in this case is usually the production manager. This board is about the production issues. In office the business improvement officer is in responsible for that board. One of the reasons why we have the boards in the plant is that later the ideas are inserted into the global system by management. This is also due a language barrier between Chinese and English natives. We have different levels of meetings in the organisation where the ideas can be discussed. Local site BIB, Asia BIB and a bigger meeting where Asia, Finland and Norway all get together. If the project is very complex the idea can be taken to this meeting.</p> <p><b>Impact:</b> Most of the ideas are rather incremental. The cultural impact is significant due the reporting structure that tackles the difficulty of maintaining the innovative culture.</p> <p><b>Life span:</b> The Innovation Port is not the first innovation platform used in the case company. The Innovation Port has been in use since 2014.</p> <p><b>Responsible instance in the company:</b> One person is responsible for the documentation of all the ideas. He submits these ideas into an Excel, which includes the submission date and also a due date, when the response should come from the idea owner. In the plant a monthly operation meeting is held where 10 minutes is given for this guy to present ideation performance in the plant.</p> <p><b>Level of openness:</b> The Innovation Port is open for the entire company globally but due to language barrier it is difficult for Chinese to approach. This is why ideas are collected locally and later submitted to the system.</p>
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	<p><b>Challenges:</b> Biggest challenge for us is to maintain the culture for innovations. Every month we have many ideas. How can we keep up this level of ideation? How to maintain the level of ideas? Time allocation is little problematic for the ideas. As new projects occur it is difficult to handle the overall plant time management. As project management we have a risk assessment responsibility. We of course allocate resources according to the risks for the projects. The biggest issue is not the project management but the sponsors. Normally we don't want one sponsor to be running more than three projects at the same time. Sponsors task is to allocate resources, give clear guidance agree on the deliverable. You spent a lot of time to discuss with the project manager to understand the project. People want to run many projects at the same time because they see that the idea is interesting. Sometimes it is difficult to find the right sponsor. In global scale it is challenging sometimes to find the right one. The Chinese don't know how to use the system. In the office the online platform is okay but in the blue-collar workers it is not so easy.</p> <p><b>Output:</b> The value of the idea is seen very fast. The average for shanghai plant in Rolls-Royce is 60 to 70 ideas per month in Europe around 20 or 30 also compared to other players in the industry we are quite high with the number of ideas created. Around 10 % will go into formal process. Most of the ideas are rather incremental.</p> <p><b>Structure of the platform:</b> First the employee comes up with an idea. The next step is to write this idea into the writing board located in the plant. These ideas are discussed every morning. Actions regarding the needs or the idea are taken. The idea is given to an idea owner who then has a reporting responsibility about the development of the idea. The owner department can also refuse from developing a certain idea. Then this idea will be put into a long-term idea bank which means that it will be reviewed later. Normally refusal comes because for the need of more resources or more time. Also due the issue the issue is too complex. Then this idea might be developed into a project and a black belt or green belt [six sigma] will be devoted to this project. In the case company there are four different levels for projects "just do it quickly", "One to two weeks", "Small project" and a "Cross site project" in which a more senior manager is involved. This manager is usually a black belt. The ideas are also put into excel by a selected employee. Then the managers review all the ideas and the development of overall ideation improvement in a monthly operations meeting.</p> <p><b>Roles divided in the organisation:</b> The "blue collars" who work as idea generators, the "management" level who work as the idea owners and hold the reporting responsibility to blue collars, the "reporting employee" who reports the overall ideation activity in the monthly operation meeting to the management, the three levels of meetings held in the organisation: "local BIB", "Country BIB" and finally the "Cross country BIB"</p> <p><b>Future of the platform:</b> In the future we are planning to expand the boards around other cells such as sales so that they also have a very morning meeting.</p>
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<p>Case 4.</p> <p>Konecranes / Business Factory</p>	<p><b>Enablers:</b> Origin of the idea development: The innovation process in the company seemed to be too complex and had too many steps and formalities. The innovation processes in the company were so complex that they were not to be articulated to the outside world and they were kept internal only. We are not supposed to use the word innovation process anymore due the word process is that all the functions in processes follow each other in a specific order. During the last 5 years not a single innovation process has followed the same path with another.</p> <p><b>Target:</b> The target of the Business Factory is to find business models for existing innovations in the organisations and to support ideas that otherwise would possibly not find support in the organisation. These ideas might be too radical for the companies existing business models. The Business Factory is for ideas that are little bit different from either from their business case or proposal. Or their field of application is different or technology is something new. These are ideas that seem promising.</p> <p><b>Supportive activities:</b> Konecranes has opened platforms to support the ideation phase of the innovation process. The name of the now existing ideation platform is Orchidea, which was taken into use in 2010. However The Orchidea online ideation platform has nothing to do with the Business Factory, that is meant for validating the business cases behind the new innovations in the organization. It is also used for finding new businesses for existing technologies in the company. The Orchidea was seen as really useful tool to support the innovation process. This platform is used as a collaboration tool more than a process tool. There are decision-making spots in the platform. We have created two levels of processes. We have the product development phase and the so-called platform phase. Using sounding boards does the idea screening. For example someone in Chile gets an idea. The next step for him is to contact the local innovation agent. They have a network. Their task is to support this person in the early stage of this idea. The innovation agents are divided into regions [5 regions]. These subgroups decide which ideas should have some continuance.</p> <p>We also have a sprint model for innovations where with very little bureaucracy we can have first level actions done. Immediately when the idea is visible we start to discuss if it relates to some of our business cases we start to discuss with them. We ask the experts there if this idea has some value in it. The regional teams have specific amount of resources to use for prototyping. There are differences between regions.</p> <p><b>Internal radicalness:</b> The ideas submitted to The Business Factory are ideas that are seen promising. The main organization however is thinking about the short-term success or doesn't necessarily want to start working with moon climbers that are seen very radical in the company for example. Business factory is totally new idea in Konecranes. Normative innovation management in Konecranes started in 2010. During the four years we have had several good ideas that seem opportunities but the line organisations interests have been in different places. And these ideas could not be executed there. This might be due the allocation of the resources. The people are allocated to the basic business fields of the company. It is challenging to put people to work with radical uncertain projects. We had these cases and then we decided that they should be organized and then we did this with the business factory. This was done because the cases did not improve. The profit requirements for the projects in the business factory are bit different than in the line organization [Not as strict and short-term-driven].</p>
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	<p><b>Life cycle:</b> The Business Factory was established in the beginning of 2015. It was built next to the formal idea-collecting tool Orchidea that was taken in use in 2010.</p> <p>Level of openness: The business factory is an offline platform. The Orchidea platform is open for the whole organization and the discussion is open about everything but the Business Factory is really closed. This is for two reasons. If we want to get outcomes in two months we cannot ask the whole organization for approval and if the project validation is successful we can start to push them out more but before this not so much. We are not working on informing the organization about the projects but we are working on the projects them selves.</p> <p><b>Structure of the platform:</b> We have some structure in the innovation processes such as an incubation stage and analysis stage, Implementation stage. This is the most detailed structure that can be given about the innovation process. In the evaluation stage we have to think is the evaluation about technical feasibility or market viability. This shifts a lot. The Business Factory is for ideas that are little bit different form. Either from their business case or proposal or their field of application is different or technology is something new. These are ideas that seem promising. The main organization how ever is thinking about the short-term success or doesn't want to start working with moon climbers for example. These are ideas that they would not support so much but witch does have some potential. These kinds of cases that we have in The Business Factory were started in the beginning of 2015 are then introduced to the board of managers. The goal is also to work as much with the customer of the case as possible. The ideas can be new technology for old new or new technology for new need but mostly they are new ways of creating business cases form existing technology. In The Business Factory the ideas were first found. Then the ideas were taken to the board of managers to review. After this the business case is validated with customers and then taken to the board again where the decision of killing or moving forward is made. On one case we are validating the business case. On the other we already know the business case exists but not sure if we can handle two different kinds of business models at the same time.</p>
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<p>Case 5. Apple / Community Interaction</p>	<p><b>Enablers:</b> The Company's culture has supported community interaction more than any other platform through its whole history. There used to exist an online platform for sharing ideas but this platform was later taken out of use due it doesn't fit the company's company culture. The company is said to be surprisingly disorganised work place. The system for finding and discussing new ideas in the company is based on using community. In this interaction the only channel for seeking resource allocation for new ideas is by discussing ideas with other employees and this way finding support for ideas. High level of commitment from the employees enables the innovative culture to exist. There are no formal presentations of ideas. Only having discussions about ideas in the organisation diffuses them.</p> <p><b>Target:</b> Stated that it is emphasised to document all the things done in the team. It has become more convenient to record videos and this enables the easy recording. The system is stated not to be really systematic. A lot of material is created to explain the design landscape of a particular product and topic next to these documents we have videos to better explain the documented idea. This supports the culture of filming processes for later needs.</p> <p><b>Supportive activity:</b> Videos are captured from processes by the interviewed team. The team is concentrated in interaction design for new products and the videos are later used in case something usable has been created in the past.</p> <p><b>Internal radicalness:</b> The interactive culture has existed in the company through out its existence. However the video capturing as a supportive activity started around 2012. The interviewed team is the only team in the company using the video capturing as a method for saving new ideas for further development in a semi structured method.</p> <p><b>Responsible instance in the company:</b> There is no formal screening process for new ideas. If an idea creator is not responsible for the execution of the idea he will show it to the responsible team (design team and engineering team for example). These teams think together how they could collaborate. It's described as a "back and forth process". Decision-making has been divided according to feasibility (engineering), desirability (design) and viability (business).</p> <p>It is stated that desirability is the most important part at the case company. One of the key differentiator for the case company is said to be persistence. If a new feature is found to be interesting for further development a lot of time is spent to figure out how it can be achieved. On the other hand big projects can be cancelled even after long time of working around them in case they are not getting enough support.</p> <p><b>Level of openness:</b> The level of local openness is high although the company is said to be relatively secretly and projects are quite secret internally. The access to resource allocation is quite open to all levels of employees. The teams are interdisciplinary which helps the openness and diffusion through the company.</p> <p><b>Challenges:</b> Scale is one of the problems the company is facing. How to maintain the innovative culture in the company? Fast expansion can be a difficulty for this culture. In 2012 around 87 thousand people had ever worked for the case company. 2015 the number is up to 300 thousand.</p>
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	<p><b>Output:</b> Always when releasing a new product it revolves around a message the company wants to convey. Ideas are usually created around this message</p> <p><b>Structure of the platform:</b> The idea is shown to the people who are responsible for that specific product where the idea relates. If they are exited about it they will take it over. If hey don't like – the second option is that one can go up the management chain and you can ask if an executive likes it and if they do they will force others to work on it. If he innovation doesn't diffuse from bottom up it happens top down. The company is organised by discipline so every single team is a mixture of people from different management structures. This happens informally when the team are formed around different topics.</p>
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*Table 5: Case descriptions, Private Sector Companies*

# Case descriptions from Public Sector Research Organisations

Organisation	Revenue total 2014 €/CHF	Revenue from public sector 2014
CERN	1.100 million CHF	1.100 million CHF
VTT	251.0 million €	217,9 million €*

\*Including revenue from public sector and basic governmental funding

*Table 6: Revenue in PSROs' / public revenue*

Source: VTT Review (2014); CERN annual report (2014)

Public Sector Organisation	Name of the Case	Interviewee
1. European Organization for Nuclear Research (CERN)	1. Consortium between instances involved in the ATLAS experiment	1. Development & Innovation (DG-DI-DI) 2. Scientific Network Coordinator & Senior Physicist
2. Technical Research Centre of Finland Ltd (VTT),	2. IBET	Vice President of Research Strategy

*Table 7: List of PSROs' and case projects in the order of interviews*

Case	Description / Code
<p>Case 1.</p> <p>Consortium between instances involved in the ATLAS experiment</p>	<p><b>Enablers:</b> The innovation processes goal in this organisation is functional instrumentation for experiments done with particle detectors. When a new innovation process starts the first stage is where the required capabilities of the new detector are defined. The time scale for product to launch for new improvement project for a detector is 5-10 years. The first part of the project is driven by physics and basic research that reveals what is need to achieve measurement goals when the detector is in use. The improvement level for the new process is factor 5-10. This means that when new product design process is started - all the technologies needed to achieve the goals don't exist yet or are in extremely early stage of development. The ideas for new innovation are found by interactions done in a consortium arranged among different instances. These instances are universities, research groups and companies around the world. The method for finding the new ideas are seminars and research papers shared among these instances. The case organization doesn't actively look for ideas but the ideas are presented and selected by the community consisting from these instances. In the first phase of a new project the needed specifications are written and published for researchers around the world to see.</p> <p><b>Origin of the idea development:</b> Dissemination of ideas in the community works with ages old method of science where one publishes an idea and creates discussion around it and this way finds collaboration around the idea. The support for ideas is established trough interaction established in scientific manner but also human-to-human relations play a role in decision-making.</p> <p><b>Target:</b> The target of the consortium is to find alternatives for technologies used in the process of creating new instruments for physical experiments. After setting the specification for the needs for this – approximately 2 years are spent to find the suitable technological solution. Different research groups in the consortium will support different suitable technological solutions. Usually for each solution 3 different technological solutions will compete to be added to the project. The selection of the suitable solution is done by majority of the community. The majority selection is used to maximize the community satisfaction. Sometimes the community might not go for the best technical solution. “This is called crowd wisdom”.</p> <p><b>Supportive activities:</b> The employees in the organization have two level projects. One formal project that is defined by the organization and one that is selected by the employee. In the organization non-allocated financing can be shared for projects that don't support the formal the project. Publications and scientific channels are the most used for sharing information in the organization. Also an internal documentation system for all technical documentation is in use, which contains blueprints, construction papers, test results, production data and individual component information for example. Scientists in the community take claims for their ideas and they like to present their ideas. This is why the community has many workshops and seminars where the ideas are presented and shared among the community.</p>

	<p><b>Impact:</b> The consortium is the main channel for the community to create new innovations.</p> <p><b>Life span:</b> The organization has been created around the consortium as a platform for creating new innovations.</p> <p><b>Responsible instances:</b> Project manager is in charge of the project taking care of the time line and finance. The research community around the project works as a flat organization executing the solution in collaboration with external companies. The universities work as a supervisory board for the project.</p> <p><b>Level of openness:</b> The innovations created the organization are public in the extent of scientific findings. Working among external companies who work as producers for hardware makes the process sometimes more closed. Normally the method for the organization is to publish all innovations and this way makes patenting them impossible.</p> <p><b>Challenges:</b> How to get 10 research groups containing 200 people together to converse on one single solution and most likely to drop their favourite solution from the development and also to participate on the overall development of the detector.</p> <p><b>Output:</b> The output of the consortium is to find the best possible solution for technological improvements in the process of building the particle detector. The best possible technical solution might not always be reached or is subjective by its nature. This is due to the nature of the community and the selection process of the best technological solutions.</p> <p><b>Structure of the platform:</b> The consortium consists from institutes from public and private sectors. These instances are universities, research groups and private companies. The universities and research groups work as idea generators that provide the research-community with solutions for technical challenges. The private sector companies work in collaboration with the organization. The organization is capable of providing scientific data from products for the private sector companies where as the companies provide manufacturing facilities for the organization, which doesn't have these capabilities itself.</p>
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IBET	<p><b>Enablers:</b> IBET was launched in 2014 to find ideas for Innovative Business proposals from Emerging Technologies. IBET is a new instrument, which works as a combination of top down and bottom up where the organisation picks up new ideas from the employees. The IBET is meant to be a fast track for innovations. People are encouraged to fail but to fail in the early stage of the innovation process. The organisation had a platform for finding ideas for emerging technologies. In this platform the innovation process was seen as somewhat lengthy. In the previous platform for finding ideas for emerging technologies the funding was divided in a different way for the selected projects. In the former platform significant amounts of funding was given to a small number of projects. In IBET the same funding is given to 10 to 15 projects. The IBET is using the funding that was used in the previous platform. The projects in the former platform were secret and not enough people in the organisation knew about them. The organisation has around 2500 employees. In case 2500 researchers start to submit ideas with out some formalities it is chaotic. Money in the organisation allocated for new radical ideas is limited. The management in the organisation wants to make sure that they are in the position to chose what type of projects they are going to be part of.</p> <p><b>Origin of the idea development:</b> Vice president for research trusting and foresight came up with an idea of establishing the IBET on the existing platform that funded ideas in emerging technologies. The decision of moving the IBET platform forward was made by the CTO of the organisation.</p> <p><b>Target:</b> The IBET platform is horizontal in the organisation and one of the few instruments in the organisation that force people to work across the organisational boundaries. The target for the IBET is to fins few hundred ideas for a quick filtering so that they can be transformed into inventions with in a year or so. The target is to make the ideas somewhat market ready within this time scope. In IBET almost all kinds of innovations are welcome as long as they are with in organisations strategy. The ideas in IBET are ideas that don't fall into any existing sectors in the organisation. The organisation has programs called spearheads of innovations. These programs also have funding to allocate for radical innovations but only in the scope of their own field. Sometimes we ask ideas on specifically topics. When the call for ideas is started the platform usually receives around 200 ideas. Then selected experts from the organisation cluster the ideas and combine similar ideas. In the end around 3 ideas or idea combinations are selected into further development.</p> <p><b>Supportive activities:</b> The selected idea creators are invited to brainstorm their ideas two times a year. In this meeting the idea is to motivate and inspire these idea creators. After the ideas have been screened the selected the idea creators are invited to work on a pitch. The point in the pitch is to make the ideas as marketable as possible. The pitch is a measure of viability. This pitch is given to the board that consists from five selected senior employees and invited experts from the organisation.</p> <p><b>Internal radicalness:</b> The IBET is changing the mind-set of the employees. Instead of creating science and technology they have to create something that actually has a clear impact. In the organisation this is a very radical approach towards innovations. The decision to take the ideas resented in the IBET into forward development will be made in three days after presenting the pitch to the board of experts. This is makes the IBET radical in the organisation due usually processes are much slower.</p>
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**Impact:** All employees are encouraged to insert ideas in to the IBET. The ideas don't necessary have to be executed by the idea creator alone but the allocated funding can be used to find people to work with the project. The organisation has three business sectors. Within each of the sectors there are around 6 research areas. Each of these research areas consist around 4 to 5 teams. In the IBET there are many teams working for same topic or a project. This is good for the organisation due it diffuses the knowledge about different competences within the organisation. This helps the general innovation capabilities and new things are done which otherwise would not be done.

**Life span:** The IBET was started in 2014. It was built on an existing platform created for funding projects from the field of emerging technologies.

**Responsible instances:** five senior employees and invited technology experts do The selection of ideas. The experts will advice on the ideas and act as mentors in some cases. These experts are research professors, principle investigators or scientists. They give the board advices due they know about the global development in specific areas.

**Level of openness:** The ideas in the platform can either be published or conditionally closed in case the idea creator insists this. The ideas are shared with team leaders in the organisation. So that these people can share know how with people who need it. With in VTT we do have a sharing of ideas. Typically the knowledge about upcoming funding opportunities for new projects is diffused in the organisation with face-to-face discussions. After the knowledge is diffused people sometimes find out competences that could be combined. This is where the added value for new innovations is in many cases. This process is visible in the organisation but something that is not formalised or online. It's not tight by any requirements or bureaucracy or anything like that.

**Challenges:** Sometimes the organisation has too many ideas and not enough funding to carry them out. Sometimes a lack of resources. Usually the best people are always overloaded with work, it becomes difficult to prioritise their work. Question is should the professionals be working with customers or with something out of the box and that is totally new. We always have an issue how to allocate resources. The organisation has mentor and mentored structure. This allows the overloaded work to be spread among the mentored if needed.

**Output:** After the screening and filtering of new ideas the selected ones are developed into innovations with in a year. The projects can be stirred into multiple directions. The projects are led into an outcome that we can show to existing customers. Otherwise it becomes a part of standard research and development activities in the organisation.

**Structure of the platform:** The IBET is a platform concentrated on finding new wild ideas around emerging technologies. The board of five senior employees and selected experts from different spearheads of innovations announce a call of ideas. After this all the employees in the organisations are encouraged to insert ideas to the platform. Usually around 200 ideas are submitted from all levels of organisational structure. The board of five senior employees and selected experts screens these ideas. The

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	select ten ideas to be moved into next step in the process. In this step the idea creators are invited to create a pitch about their idea. These idea creators work in collaboration while doing their pitches to ensure cross-disciplinary collaboration and motivation among the idea creators. The goal of the pitch is to force the idea creators to form their idea into a marketable and easy to understand format. The outputs of the IBET should be innovations that are executable within a year from the screening of the ideas. After this the board of five senior employees and selected experts allocate resources to the ideas that are developed into projects.
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*Table 8: Case descriptions, Public Sector Research Organisations*

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## **RESEARCH FINDINGS**



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# Structure of research findings

In this section I will provide basic knowledge about the findings made during the research.

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**The findings** were gathered from interviews conducted among experts from the selected case companies and the findings are interpretations made by the researcher according to the transcribed data collected from these interviews.

**The structure** of the findings will start with a description about the general findings made from the case companies. As my first set of questions addressed the companies overall innovation capabilities- this section discusses these findings. In this section different factors are that affect the FEI in the organisations are discussed. The global impact and leadership are defined in the setting of innovation management in the case organisations. Going through some key figures collected about the organisations will help to assess the organisations into spectrum.

**As mentioned** before the interview questions were divided into three sets from which the first set spanned from questions aiming to clarify the interviewees' role in the organisation. With the second block of the questions I tried to find out detailed information about the organisations innovation capabilities and how innovations were carried out.

**I asked** the interviewee to describe the formal process used in the organisation for carrying out innovations. In the third block of questions I asked the interviewee to explain a case example of how ideas in the FEI were found for innovations in the organisation.

**The expert sample** ranged from Innovation Managers, Design Managers, Chief Technology Officers, Operation Managers, Vice President of R&D and Senior Physicist. All of the interviewees were in a position capable for making decisions regarding FEI activities within the organisation. The time of employment in the organisations varied from 6 to 15 years. It was also important for the research to find experts that have close relation to the case chosen for the study. In some cases the first expert interviewed from an organisation felt uncomfortable answering detailed questions regarding the given case example. This is why in some cases I interviewed two people from the same organisation.

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## **General findings**

All of the organisations use some level of formality in the screening process for innovations.

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**All tough** all have levels of formality - differences in the approach to formality can be seen among the sample. The attitude towards formality when talking about new ideas was in most cases negative. The formality was seen as a suppressing rather than supporting activity when trying to find new ideas.

**An Interesting** question regarding the cross-case analysis was the overall time span used for innovation processes in the organisations.

**Time used** for innovations in the private sector and in the public sector had differences that might be one of the key differentiators among these sectors. I asked the experts to give me their rough estimate on how many ideas are created and documented in the organisation and how many of these ideas are actually executed into some form of product or a service development.

**I asked** the experts to tell me how do they find new ideas for further development in the company. In most of the cases this question did not cause any hesitation or confusion. Almost all of the experts saw this question as a relevant opening as the idea collecting is seen as a major part of company strategy at this time. This question also laid foundations to the third set of the questions, which was about a case example chosen together with the interviewee. All of the cases selected in the private sector were about processes or platforms used for finding new ideas within the organisation.

**Also** one of the case examples from the PSROs' was directly about a platform created intentionally for finding new ideas from the organisation however the experts from the second PSRO focused more on the outcome of the idea finding processes. This might be due this organisation does not use intentionally any platforms for finding new ideas for improving their technical activities. However in this research - interpreted from collected information from this PSRO – there is a clear system for finding new ideas. However the scale and use of this system is somewhat different compared to the others found in this research. The organisation used an idea-capturing system that can be defined as follows: Globally, Externally Conditionally Open Online System with high level of support from offline activities and CoP interaction. The system in this organisation has similarities with one of the private companies systems except the openness and globalism of the system have some differences.

**I asked** the experts to tell me about the challenges they face in finding new ideas. All of the experts were willing to share the organisations struggles in the FEI. Many of the companies saw the size and globalisation of the organisation as a major challenge when capturing ideas. Also defined or non-defined but clearly present was the problem of putting in use new radical innovations that don't have any business owners in the organisation. In many companies these ideas were found to be potential but difficulties in utilising them could be seen.



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**Many** of the organisations had already taken actions towards fixing these challenges and usually the platform or a process for finding and screening new ideas had been iterated and developed during its existence as the organisation was learning new phenomena's around the FEI. For example side platforms were created for utilising these ideas in somewhat ambidextrous manner where the ideas had some "Skunk Work" kind of mentality. In one of the companies the platform "Business Factory" was a platform closed from the companies employees. This platform - where radical and potential ideas found from the official system of idea finding – where captured – was meant to open the company totally new business areas.

**The struggles** around the FEI were somewhat similar through the entire sample from the private sector. This can be one of the generalisations drawn from the sample. These challenges however differ a bit from the ones from the public sector organisations. The struggles in the public sector were more case specific and did not have so close relations with each other.

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# Innovation management frameworks in the case organisations

**These findings** are interpretations of the knowledge shared by the experts and might differ from the formal strategy presented by the company in public.

**In the interviews** the experts were asked about the formal innovation process that is in use in the organisation to carry out new innovations. Three of the five case companies stated that they don't have any pre assigned formal process for innovations Such as Stage Gate systems. Although they did explain that some formality exists in the form of the order in which the innovation is carried out. This was described to have steps such as evaluating ideas, generating content around them and then implementing the ideas.

**Some** of the interviewees even had a negative approach to talking about formal processes for innovations. All of the companies did have parameters for deciding whether ideas are carried out or not but the parameters and decision makers varied. There are also different players affecting the process of idea generation, idea capturing and pushing it into a project. Stating that the formality in the process causes unnecessary reporting responsibilities and that every innovation process follows an individual path. In all of the companies the finding of ideas for new innovations was formalised except one in which the creation and sharing ideas for new innovations happened purely in human interaction and by finding support for your ideas in informal setting in the organisation. The formalisation of finding new ideas means that a platform was intentionally created for submitting ideas.

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## **Global organisation and leadership**

I asked the experts about the role of leadership in finding new ideas and who is responsible for screening new ideas for further development.

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**The leadership** in the organisations was usually seen as a cultural enabler from the point of FEI. Defined management sometimes called “Agent” or a “Champion” did the screening of the ideas. They are responsible in supporting the activities in the FEI of the organisations without being given much power in allocation of the resources. For example in one of the case companies the champion was responsible of picking the best ideas to be presented to a steering group. Also seen important task for the champion was the screening of ideas to recognise things that have already been tried in the company or have been patented already. This also means that the champion should have rather deep prior knowledge regarding the company’s innovation history.

“...We have to take encounter that any of our units don't have the same history so knowing what has been done in the past already is quite demanding...”

**This was** also seen as a challenge when globalising and expanding the company’s innovation capabilities. Especially demanding this is seen to be in a company that utilises the so-called “Locally leveraged strategy” - which is explained later.

**In the 1990's** a dramatic expansion of international R&D took place in Europe. Companies located in Netherlands and Switzerland were conducting more then 50% of their innovation activities in divisions located in other countries while the average in western Europe was around 30%. In USA the rate was around 5%. Organising and managing innovations has become interesting for multinational companies. (M.Schilling 2013)

**Firms** should assign or encourage a senior member of the company to champion a new product development project. This however is not an easy task for a multinational corporation (Cooper, 1990). According to the studies these champions should have the power to allocate capital and human resources for projects. Not in all cases this happened and also agents working as information catalysts were used to manage information about new ideas forward in the company hierarchy. Usually in the case companies studied in this research the innovation catalysts were only given a role of skimming trough the ideas and suggestions in the FEI and to put them forward after this pre screening. It can be argued if this selected employee has the capability to ensure that the radical, cross section, process or product ideas find their way to the actual successful decision making in the organisation.

**According to Schilling (2013)**, 2001 68% of North American firms, 58% of European firms and 48% of Japanese firms were reported using senior managers to champion new product development projects. This could be seen in the case companies as well but the usage of these senior managers as champions is not as black and white – meaning that the idea screening and pre decision making could be undertaken already before potential champion for the project ever received information about the possible new idea. This was in some cases attributed to globalisation. Even if the companies system for finding new ideas was highly formalised – an Internally Open Online System for example - still the idea screening could be undertaken in a local setting due to the lack of real access to the platform for all levels of hierarchy in the company.

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**The access restriction** could be explained by language barrier for example. The system was in a language not commonly so used in the local setting. This restriction was unintentional.

**It was also said** that the use of senior champions in this way might be harmful for companies as killing unsuccessful projects in the early stage even when predictions for success are weak can be difficult. This is said to be the case based on if some emotional attachment to the project has been established. On the other hand there are examples of projects with extremely weak success predictions that have ended up thriving only due the almost fanatical zeal and persistence of their champion (M.Schilling 2013).

**Openness** of the ideas created in the companies had some variance. Most of the companies had platforms, which were internally open and accessible for the employee but in some cases innovations were created outside the platform with out opening the process in any point until the last moment of the idea presentation to the platform. The reasons for creating projects outside the formal platform also varied from the projects high level of radicalness or the particular local nature of the ideas.

**As explained by Schilling (2013)**, there is four strategies of globalisation that effects innovations in companies: First in the “Centre-for-global” strategy all innovation activities are conducted in a central hub and the diffused trough the entire company Second is the “Local-for-local” strategy where all the divisions or subsidiary of the company conducts its own R&D activities tailored for the needs of their own local market Third Strategy is “Locally leveraged” strategy where all the divisions conduct the second strategy but the company tries to leverage the innovation results to the whole company. Fourth strategy is the “Globally linked” strategy where the innovation activities are decentralised but also centrally coordinated for the global needs of the company

**Overall** the openness of ideas was seen as a positive feature but in reality the way openness was created in some cases appeared to be two sided. All the ideas in the platform were open and the platform was seen as the main system for collecting and sharing ideas – but on the other hand some ideas were being executed outside the system. The transparency of the idea disappeared as soon as the idea was moved into execution stage even if the idea platform itself was referred to be open.

**One** of the key questions about the companies’ front-end strategy was about the way front-end activities are documented in the company. All companies used tools for capturing these front-end activities. Most of them used online platforms.

**In all of the companies** and organisations studied for this research new innovations were seen as a vital component for the future success of the organisation. Both sectors – public and private - take finding initial ideas for new innovations as a serious part of their strategies. The way that these ideas were captured varied between the sectors. Variance within public sector was much higher than in the public sector where the methods used for this capturing were somewhat similar.

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## **Online platforms as tools for FEI**

In this section I explain how the usage of online tools affects the FEI activities in the case companies and what findings were gathered about these activities during this research.

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**Online** tools in this research mean tools that are used for transferring knowledge within or outside an organisation by utilising intranet or Internet. These online tools can also be called online platforms due to their nature of having many different sorts of applications and features collected into one system. The online tool provides a platform for all these different features to be used simultaneously.

**Quite often** these online tools are used within the case companies intranet that allow them to stay only among the reach of the case companies employee or external partners. The reason stated for this in many companies was the problems caused by potential IPR risks. There were two reasons for the IPR being an exposure-reducing factor. On some of the case companies work in the business-to-business sector where they need to be careful about not exposing the client companies intellectual information. The second reason is the companies internal need to secure intellectual rights as new innovations occurred.

**Two** of the case companies had tried co-creation methods and the platforms had been opened in to “conditionally open spaces”. The conditionally open space refers to a space – in this case a virtual space, which is opened up to the customer only partly and with certain conditions. The open-conditionally open-closed space theory was presented by Hanna Nordlund (2009) studying how companies use different levels of openness in the FEI in product development. The conditionally open spaces in this research mean that the companies opened the platform for collaborative instance only regarding the parts that had something to do with the project at hand but not entirely to the extent of exposing all the ideas created in the company for example (H.Nordlund, 2009).

**The use** of online platforms in the FEI to find new ideas within the company varied from company to company and organisation to organisation. Differences in the ways online platforms were used for FEI exist. Every company had their own strategy in the way they approach FEI and no normative rules for using online tools for FEI can be drawn in the case companies and organisations in this research. Also worth mentioning is that the combination and relation of online and off-online – so-called online supportive activities differ.

Usually the online tools followed a structure where the employees were able to upload and share an idea into an internally open platform by using text or video.

**After** submitting the idea other employees were able to review the ideas. Also the ability to discuss these ideas openly was provided in most of the cases. After an agent reviewed the idea or a champion the decision was made whether the idea will be moved forward into the formalised process for innovations. The idea was then sent to the managerial level decision maker who then made the decision about funding and use of the idea. In some cases the idea creator was asked to execute the idea and in some cases the ideas were simply openly utilisable by other employees and the organisation. Many parameters for clustering the companies’ usage of the online platform were used.

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## Supporting activities for FEI platforms

Supporting activities for front-end activities include face-to-face interaction, hand written notes, videos, workshops, probes and educational encounters.

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**Many** of the companies used these offline tools to support the usage of the online tools. In some cases the off-line tools can be seen vital in order to keep the online tool viral. In some of the companies a combination of online tool and offline activities was seen as a successful combination. In some cases the online tool was taken into use but in a somewhat natural way the ideation has shifted into the usage of the offline tools. In some cases a significant difference can be seen in the way that the supporting activities were actually seen as the more significant channel for FEI then the online platform. In one of the cases an offline tool called idea board was used locally for collecting ideas. These ideas were hand written and later reviewed by middle management.

**After** screening the middle management added the ideas into a global ideation platform. This process sounds rather random but was quite formal. Weekly meetings among all the employees were conducted where a few minutes were used for discussing the idea board. This two-step ideation method was also done due the language barrier experienced in a multinational company.

**The online** tool was used in English and the workers who then were supposed to insert ideas were only capable of using Chinese platforms. This is one of the main reasons for the ideas to be screened before they were added into the global platform. One other reason was that most of the ideas were seen to be rather incremental and had impact in the local plant. This is why only the best ideas were placed and shared online for other global plants to review. It was also seen important to promote the online platform with offline activities like workshops and co-ideation events.



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## Roles defined in FEI

**The responsibilities given for employees in the FEI actions were seen differently in the companies.**

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**Although** all of the experts interviewed stated that the ideas should be collected from all the levels of employees' - differences in the way that the ideas should be taken forward were found. Some of the companies held the possibility for the employees to work on their own suggested ideas alone as an opportunity - while others stated that giving responsibility of to the employee will reduce the amount of given ideas as the responsibility is too high compared to the time they have.

**The differences** between these companies' strategies also differ. Others wanted to enhance the entrepreneurial mind-set in the company while others were actually looking for improvements in the existing processes – more incremental ideas in other words.

**A big theme** among the case companies was the employee engagement and cultural impact of collecting ideas from the employee.

**It was** stated multiple times among the experts that one of the key reasons for supporting the idea platform was the cultural change that the company was looking for.

**There** were many levels and roles in the organisations when talking about idea to project process. Usually the first role when opening the structure from bottom to top was the idea creator. Of course the idea creator could also be from higher levels from the companies hierarchy but the lowest level mentioned from where an idea to project level idea was received was a secretary. Depending on the strategy the company was utilising – the next role after this was the platform where the ideas were added.

**This** platform was either local offline or online global. After this platform usually the next responsible level was an innovation agent who pre-evaluated the ideas added to the platform. After this the selected ideas were either submitted to the platform or to the managerial level sounding board that would then evaluate the ideas potential for being transferred into a project. In some companies the employees were allowed to discuss the ideas added to the platform. The innovation agent used the discussion activity as a measure to find the most interesting ideas in the perspective of the employees.

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**In one of the companies the evaluation mandate was given to the employees. This means that the employees review and discuss the ideas in the online platform and choose which of the ideas in the platform are moved forward to the project stage.**

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## **CONCLUSIONS**

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## **Differences between the public and private sectors**

There are major differences in the ways innovations are carried out in the public sector technology companies and public sector research organisations.

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**The sectors** pursue different goals with their innovations and they use their innovation capabilities in different ways. There are differences in the availability of resources among the sectors. Longer timespans have been stated to be one key enabler for public sector research organisations to create new long-term innovations. The experts from the public sector stated that companies tend to pursue short-term profit with their innovations, which is said to differ from the ones conducted in the public sector.

**The public** sector innovations aim for longer term success and time used for idea to launch is said to be greater than in the private side. The reason for this is said to be that it is difficult for SME's to sustain a four years of technical development before getting any return for example. As an example the building of a particle collider built in one of the public sector organisations took 3 to 4 years of R&D time involving hundreds of employees.

**The level** of radicalness in the projects started in PSRO is very high and it is said that many of the innovation projects started in the PSRO's are such that no company could fund them due to the high level of risk. The projects take a long time in the PSRO's and when the projects are finished they might no longer be so radical anymore in the scope of the whole industry. One of the studied PSRO's started working with IoT as the first instance in Finland and stated to have started the Bio Tech industry in the country which later has become a national priority.

**The tech** companies have difficulties in making decisions about going for the long-term profits in case short-term profits are seen necessary. However bigger companies such as Siemens, G&E or Phillips are said to be at a scale that they could manage level of R&D investment that creates long-term profit.

**Also intellectual** resources seem to be a key asset for the research organisations. The access to intellectual resources in PSRO's is said to be greater. One of the experts stated that in the public sector as a manager one can allocate 5 physicists with full academic education and with years of experience alongside 5 engineers to measure a single parameter within a really short time. This is said to be somewhat difficult for private companies.

**The latter** are assets for PSRO's – however the private side plays an important role for all of the PSRO's.

**One of the PSRO's** fundamental goals is to support the technological improvement of technology companies and essentially doing this by being a non-profit organisation. The big difference between PSRO's and companies is for example that company's main interest and priority is in economical impact, which for PSRO's is more in technological, societal, and industrial side. Economical impact in PSRO's is not only bringing lots of money into PSRO's but also to many private companies. All the profits made in one of the case PSRO's for example are allocated straight to R&D, which is conducted to support Finnish technological improvement.

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**The companies** work as clients for this PSRO and they pay for measurements and support for their innovation capabilities. In one of the PSRO's the private sector works as a manufacturer for the used technologies in the machinery build for studying physical phenomenon. The PSRO doesn't obtain manufacturing capabilities for parts needed for this machinery. These machines have very stringent specifications and the parts needed which are for example cables, semi conductors or chips – are ordered from private technology companies.

**In the innovation process** these private sector companies play a role as the decision made about the sub contractor can affect the technological solution chosen for making the physical measurements. These selected contractors usually also push their innovation capabilities forward as the parts needed differ from the ones that the companies normally would produce. The companies also take a risk when accepting these construction deals but in return the PSRO measures every single detail from the parts used for the machinery and provide the companies with information about their products - which would be very difficult to obtain in any other way. This symbiosis doesn't necessary bring the companies profit but they utilise the intellectual expertise that the PSRO has.

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# Systems established for communicating generated ideas in companies and organisations

In this chapter I explain how the ideas have been submitted to a system created for finding, sharing and diffusing new ideas in the case companies and organisations.

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**As a result** of my study - I noticed that all the systems that were used for finding, sharing, diffusing and evaluating ideas in the organisations and companies - have different characteristics.

**Listing** these characteristics helps companies and organisations to specify what kind of system they are actually using for capturing ideas for further development. The defining of characteristics of a system can be referred to as defining characteristics of an object. By knowing the size, material, weight, smell and other characteristics of an object – we can say which object is under observation for example. By combining a list of characteristics that an idea capturing system has - we can more easily define it– just as after listing the characteristics of an object we are able to define a system.

**What** kinds of characteristics do the systems used in the organisations and companies have? The characters can be defined as individual components that define the structure of the whole specific system.

**In the definitions** of the system's characteristics in this study are written in a form of contradiction – for example: “Global-Local” indicates whether the system is used in a global setting or as a contradiction to that - only in a local setting. In this study the “local” means a specific plant, factory or a country office of the organisation or a company where as “global” means that it is being used by a global organisation.

**Important** to address is also the definition of system. System is a combination of two or more components that with their functions affect the overall combination of the components. A system is a group of individual components working together as a group. As explained in the Merriam-Webster dictionary: “A system is a set of interacting or interdependent

components forming an integrated whole” < <http://www.merriam-webster.com/dictionary/system>> 24.8.2015.

**This** is why the platform for communicating ideas in the organisations has been referred to as systems in this study. The system is a combination of components that have their individual characteristics. These components characteristics are introduced as a comparison from entity to another - and as such - are extremes in a way.

**Information** about these systems was collected from the experts interviewed for this research. In all the organisations some sort of system was recognised. However the characteristics of the systems varied from organisation to organisation and company to company. The systems have three main components that define the function of the system.

a) The nature of the system defines the level of online and offline activity used for communication in the system. b) The inclusivity of the system in internal or external settings defines whether the system is in use only internally in the organisation - or if external entities like universities or other companies have access into the system. c) The local or global nature of the system indicates how widely the system is being used

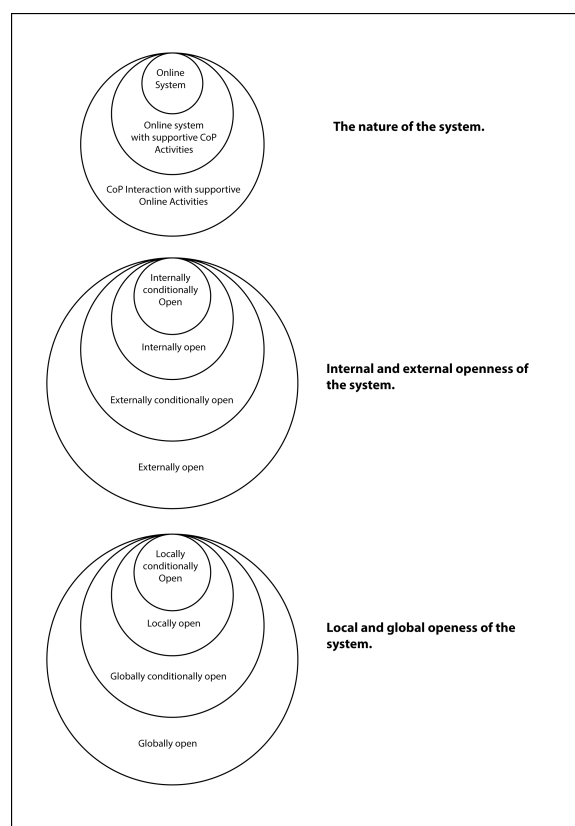


Fig. 13: Three system identifiers



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## **Characteristics of the idea capturing systems**

Five main characteristics could be distinguished from the case studies

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## **1. Internal-External**

Firstly the indication for the system is the “internality” indicating whether the system is only used internally in the organisation - or if it has some external activities are included in the process or if external parties have access into the system.

## **2. Global-Local**

Second parameter indicates if the system is “global”. This indicates whether the system is used globally in the organisation or if it’s only used in a “local” setting. The companies and organisations in this research contain entities in both settings. They are all globally influential and can potentially obtain ideas from a global network.

## **3. Open-Conditionally Open**

Third parameter indicates the “conditionality” of the openness in the system. This means that the level of openness among the employees or among external parties is variable in and among the systems. The idea of openness for the systems is based on the structure of open – closed space of customer-focused innovations created by Hanna Nordlund (2009). The openness means accessibility of information in the system. Accessibility means that the information is both available and designed in a way that that obtaining it is within ease. In this research the accessibility how ever means accessibility for the employees of the company - and some external parties as well. This however only happens in the externally conditionally open system where the company internal system is partially opened to enable collaboration with a university project group for example.

## **4. Online-Offline**

Fourth indicator shows whether the system is used in an “online” setting or if it is so called “off-line” system. Online setting means a platform used with computers and usually with Internet or companies intranet. The offline system means that the activities in the system happen out side of Internet setting in human-to-human interaction.

## **5. Role of CoP**

Lastly the CoP interaction system is mentioned which in this research means an offline interaction between employees that can have some un-formalised form of online interaction. This Community of Practise setting influences all of the systems in some level due to all the work done by employees in the organisations have some level of interaction between other employees – and this way all the ideas are also influenced by this indicator. However there are companies and organisations in which the CoP is the main system for idea screening and evaluation.

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## **Five combinations of characteristics found from studied idea finding systems**

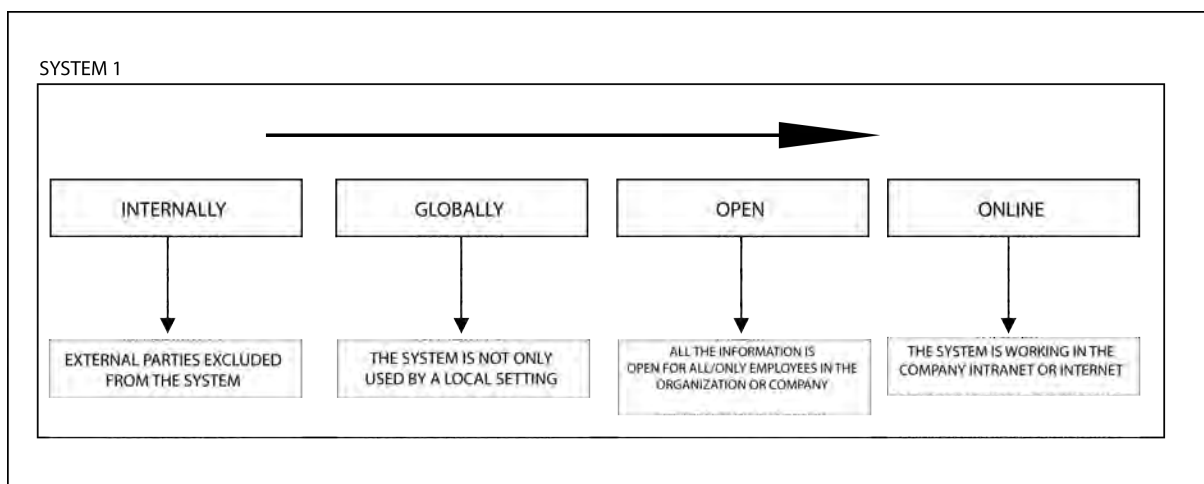
In this section I will present how the characteristic for systems can be - and are combined in the case organisations given case examples.

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# 1. Internally Globally Open Online System

**Internally globally open online system** stands for a web-based platform that is fully open for all the employees in the organisation regardless of their location, language region or level in the hierarchical status in the organisation. The system is internally open but closed for external parties.



*Fig. 14: System 1.*

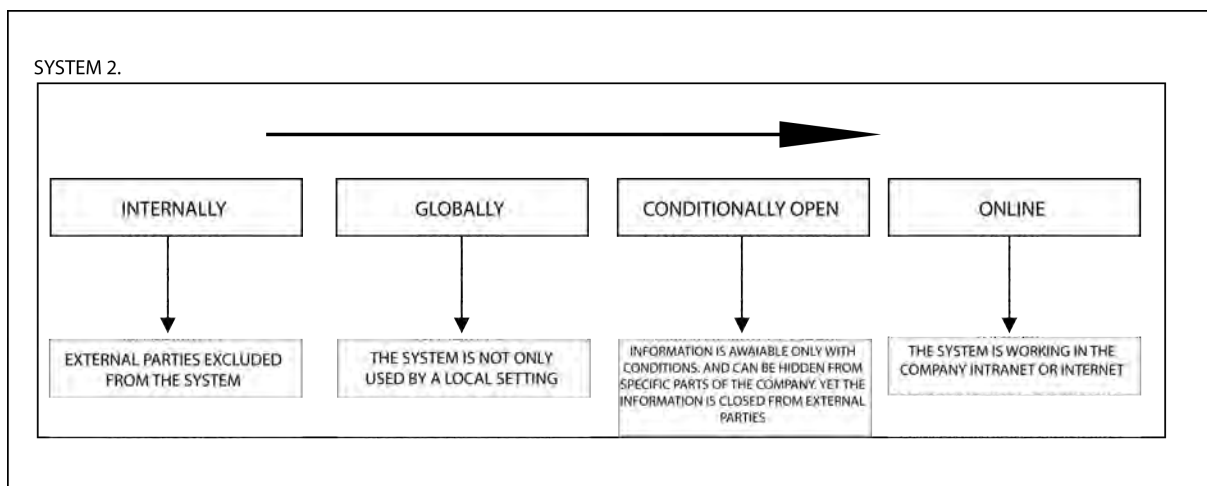
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## 2. Internally Globally Conditionally Open Online System

**Internally conditionally open online system** refers into a web-based platform that is accessible for all employees in the organisation regardless of their location, language or level in the hierarchical status in the organisation.

**The conditionality** in the platforms openness how ever means that information added to the platform can be hidden from specific parts of the organisation by the instance that adds the information in to the platform.

**All** the Internally open online systems went trough a phase of being conditionally open as they were in a test mode or used in small scale before expanding into global tools.



*Fig. 15: System 2.*

### 3. Internally Globally Conditionally Open Offline System

**Internally globally conditionally open offline system** is a system that works in a local setting and is therefore automatically somewhat conditionally open for the global organisation. Information added to the system is not internally closed from specific parts of the organisation or access is not limited from anyone in the organisation but the locality makes the platform difficult to access for all the employees. The conditionality of openness in this system is not intended but more or less inevitable. In some cases the conditionally open offline system was used as a catalyst between the local employees and the internally globally open online system due the local nature or focus for majority of ideas. The offline system could be a writing board or a so-called innovation agent that collects the ideas and is in responsibility of sending them forward. In all the cases where conditionally open offline system was used to create sense into the pool of ideas – a management level employee made pre evaluation about the ideas to be added to the internally open platform.

**Companies** using conditionally open offline systems also had internally globally conditionally open online systems in use. These how ever were conditionally open due a language barrier of location restriction. In other words - the conditionally open online platform was used in English when employees in China could not use it. This is why an offline system was in use in the local organisation. In other cases the reason might be the quality of ideas, which might vary from incremental to radical according to the activities in specific local setting.

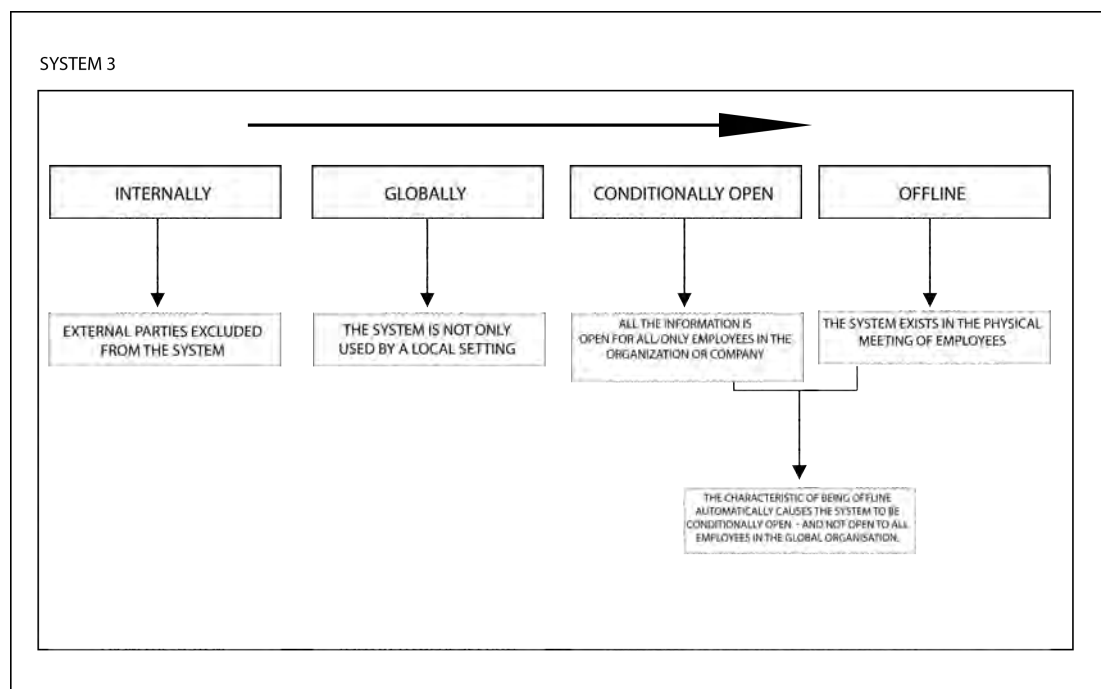


Fig. 16: System 3.

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## 4. Community of Practice Interaction

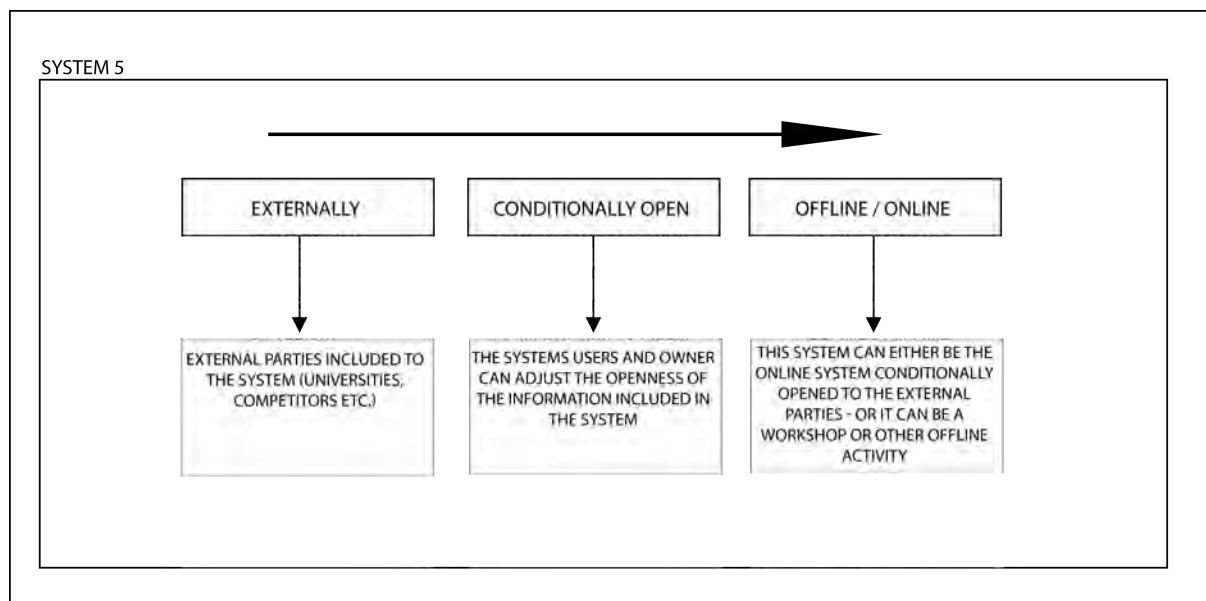
**In the Community** of Practice interaction - knowledge is transferred between employees working to accomplish a common task for example an product development project - by using face-to-face interactions for finding and supporting new ideas.

**Their peers** communicate the ideas to selected employees and usually the method is used to gain support for the presented idea in an early stage of idea generation. The more support the idea gets from the peer employees - the more likely it will be presented to a possible supporter (usually managerial level employee that in many cases carried the name “champion”) - and this way eventually pushed into a project.

**In all of the** organisations the CoP interaction affects the idea generation process but there were cases where the CoP interaction was the only mentioned method for idea capturing. To be accurate the case company that had invested most revenue to R&D among the case companies both 2013 and 2014 - was using CoP interaction as the only method for idea capturing in the organisation. It was said that internally open online platforms had been in use before but they have been taken down due their mismatch to the existing culture in the organisation.

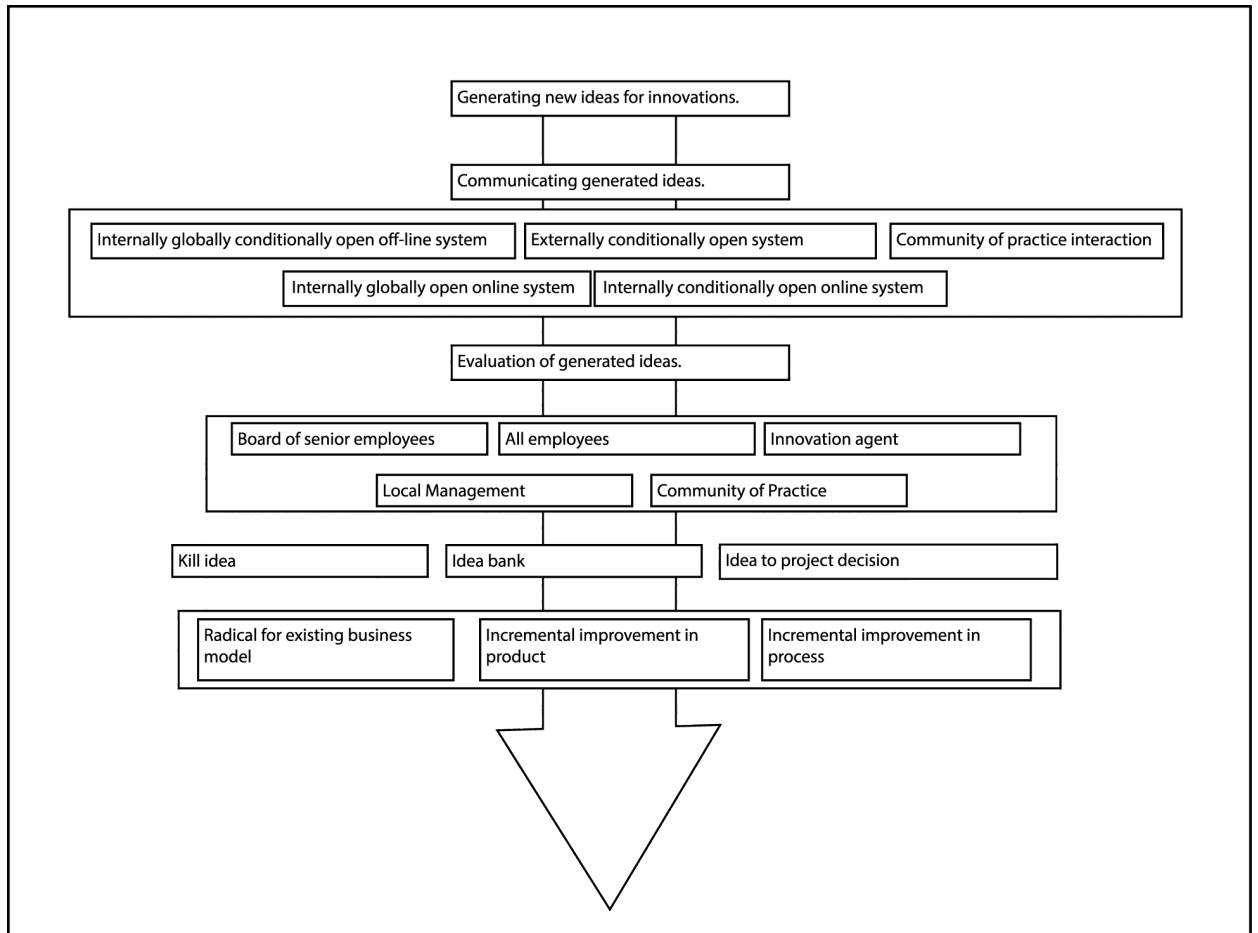
## 5. Externally Conditionally Open System (Online or Offline)

**Externally conditionally open system** works as a platform for creating and capturing idea from company external parties. The system is conditionally open to the external party as the system holder – in this case a company or an organisation - is in responsibility for controlling the data submitted in to the system. In some cases the externally open system is an online system but can also exist as a face-to-face interaction such as a workshop or a project conducted with a university for example. The online system in this use can be the same tool used in the company internally but which has features that can be covered or restricted from the external players



*Fig. 17: System 5.*





*Fig. 18: Diffusion of an idea in the case companies analysed*

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# Evaluation of generated ideas

**An important part of innovations in organisations is the way in which ideas are evaluated and by whom.**

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**In the case** organisations variance among evaluation criteria and responsible was high. Roughly five categories of evaluation were from the case organisations. In one organisation all employees were taken into the evaluation process. This example case was an internally globally open online system where peers did the evaluation of ideas. The company had committed to push selected ideas into projects. In one company and in one research organisation the Community of Practise made the decisions by finding support in offline setting for their ideas with out highly formal pattern. In rest of the organisations the decisions were made by managerial level sounding board with pre evaluation conducted by an innovation agent. This agent can be a local management level employee for example.

**The evaluation** process usually ended into either killing the idea, putting it into a central idea bank or it resulted into a project or an incremental change in an existing process or a product.

**Usually** the idea bank was a formal online platform built for ideas, which were seen as potential -but not with current capabilities of the company. The idea bank is then opened every now and then to see if some of the old ideas could benefit the company.

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## **DISCUSSION**

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## **Suggestions for FEI activities for companies and organisations**

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**The distinguishing** of a perfectly generalizable model for FEI activities is an ambitious challenge and most likely not possible to accomplish given that all companies differ as well as their markets. Innovations are complex and fundamental activities for companies and strategies must remain sufficiently flexible. This is of course a challenge that companies – especially bigger ones – face when they try to remain innovative. One of the interviewed experts stated that during the five last years not a single innovation in the company has followed the same path with another. This might mean that the predictability of innovations and ideas are often difficult. Formalising processes aims to remove or reduce uncertainty and add predictability to innovation processes and particularly the front-end. However this raises a question: should companies add predictability and remove uncertainty from the most valuable stage of innovations – the front end? If we are on the road to establish a model for improving the front end of innovation process in a company or a research organisation – it is important to understand what are the measures that define success in this part of the process. The measures from a simple point of view of course are the quality of products or services and revenue collected from the outcomes of innovation processes. But if we look closer to the starting point where the ideas arise for further development – it is impossible to know what possibilities the company has missed primarily due incapability in finding, diffusing and developing new ideas. Maybe one of the key measures that can be said to indicate a good FEI in organisation is the reflection time for ideas meaning the time for the idea to travel through the organisation from the idea creator of the idea to the resource allocator. Reflection time in this case also means the return time or feedback received by the creator from the resource allocator.

**Secondly** the variance of systems should be taken under consideration. There are different kinds of ideas, local, global, secret, expensive, radical, incremental, process, product, human related, long-term, short-term, external and internal to mention few of the naming qualities for ideas created by employees. It is ambitious to try to create a formal system to capture all of the latter in one platform, system or forum. However this seemed to be the case in many of the organisations interviewed. Creating a set of systems that enhance the diffusion of ideas that don't fall into any basket in other words – any existing business case or field that the company already has – is important. This is important in order to capture radical innovations in the organisation. In two of the companies this was mentioned as a problem, in one of the research organisations this problem was identified and addressed. The case system in this research organisation was created to capture this sort of radical ideas. Also one of the case companies had created a side system next to the formal idea-capturing system to support identification and utilisation of new radical business innovation ideas. This system was an internally closed space whereas the formal system was internally open. Thirdly the evaluation of the new ideas created by employees in the organisations and companies could be reconsidered. This means that the pre-evaluation of ideas should be conducted as little as possible before they reach the entity making the decision of resource allocation. Champions who might not have understanding about the suggested idea often conduct the pre-evaluation. According to interviewees - the radical ideas seem have a better change for succeeding in case they find their way to the instance that makes the decisions for resource allocation in the organisations or companies.

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# Assessing the research

**The main goal** of a researcher in making a study is to remain honest, clear and true to one's findings and to respect the research community with stating only the most important and relevant findings in an understandable format. My goal for this study was to better understand what happens in organisations and companies in the diffusion of new ideas for innovations. How do great ideas spur and make this world a better place in the end.

**As stated** by L. Välikangas (2015): "If the goal doesn't change during the process – nothing has been learned". <<http://www.hs.fi/ura/a1440299000159>>(25.8.2015). This also stands for this research. When It was started the goal was to find out where all ideas in the organisations and companies are submitted. As an outcome I did find answers to this question and created a set of characteristics to define these means. As the process went on – I become more and more aware about the fact that not only the variance of the means used for idea capturing is great but also the variance of different ideas created in the organisations and companies is actually as great.

**This research** was conducted as Master's Thesis for a Master of Arts degree in International Design Business Management in Aalto University. The relevance of the study in the context of Design Management is evident. As a design professional – understanding the methods and ways that ideas for new innovations diffuse through an organisation or a company is important. The importance can be defined in two ways: firstly as a designer - knowing where and how ideas should be submitted for maximal influence is vital. Secondly as a designer in a managerial position it is good to know where and how to find the best ideas from an organisation or a company.

## Suggestions for future research

**Interesting findings** about the front end activities in the companies were for example the way how ideas were taken from the systems into further development and suddenly their nature might have changed from internally open into conditionally open – meaning that they suddenly become more secret. Studying this change in the nature of ideas in the innovation process could be relevant in order to understand better why and how certain ideas are pulled or pushed forward into the formal innovation process.

**Other** interesting finding in the study was the overall attitude for formality in the innovation processes used. In almost all of the cases the interviewees' attitude towards formality was rather negative. Formality in the innovation processes was seen as a hindering force that made innovations more difficult to diffuse through organisations. Studying the actual effects of formality in innovation processes and the attitude towards it in different level of management for example could generate interesting findings.

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An interesting observation during the study was also the need for companies to centralise their ideation platforms into one instead of trying to find new innovations from multiple channels, which according to the results of this study could expose more radical ideas to the resource allocating parties in the companies. Although notable is that finding new ideas as effectively as possible might not lead into automatic increase in the companies' revenue – but could increase the costs in the R&D instead as the time allocated for champions in companies to skim through new ideas is limited. However the quality of ideas created in companies could be measured. What actions affect the quality of ideas created in companies?

## Managerial implications

**Firstly** and most importantly this study opens the characteristics of idea capturing systems used in the case companies and research organisations. Listing the characteristics and comparing them with other possible combinations can bring new understanding for managers about the mistakes and successful parts of the used system. For example understanding the effects of the local nature of the system to the overall diffusion of the ideas can be interesting. This means that in case the idea capturing system is conditionally open in a global setting and all the ideas are filtered in a local setting before they reach the global audience – they might be filtered too much by only one champion. This local filtering might be a result of language barrier unintentionally created in the systems early development stages.

**Understanding** what the idea capturing system is trying to achieve is also important. Knowing if the system is actually being used for generating ideas or if it has a task of trying to keep employees satisfied – makes a difference in the systems fundamentals.

## Limitations of the research

**As written** before in this study – the realities where a researcher works must be taken into account when working with qualitative data. The way said information is interpreted by the researcher naturally plays a role in the outcome of the research. Knowing this however hopefully can reduce the bias caused by this.

**This research** was conducted by interviewing experts in face-to-face interaction and by using Internet tools with “audio only” setups. These differences between the interview methods might lead into missing some expressions and emotions that the interviewees online would transfer to the researcher in a face-to-face interaction. All the interviewees were also originally born and located in 6 different countries - India, Finland, Switzerland, Ireland, USA and China. All interviewees mother tongue was different from English except USA and Ireland. This might have led into misunderstandings and misinterpretations. All the interview transcripts and recordings are available for further research upon request from the author of this research.

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In Shanghai, May 2015 / In Helsinki, Aug 2015

Aleksanteri Eliel Heliövaara

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# **Appendix 1: Interview Outline**

## **1. Background questions concerning the interviewee**

1. How would you describe your tasks in the organisation?
2. What is your position in the organisation and what are your duties?
3. How long have you been working in the organization?

## **2. Background questions about organisations innovation management**

1. How would you describe the formal innovation process used in your organisation?
2. Could you describe the lengths of your organisations innovation processes?
3. How would you describe leadership from the innovation point of view in your organisation?
3. Please describe the channels used for finding and screening new ideas for development in your organisation?
4. Approximately how many new product/service or process innovation ideas are introduced in your organisation yearly?
5. How many of these ideas are carried out to formal innovation process?
6. How are new ideas documented in your organisation?
7. Do employees or external parties have access to these ideas?
8. What are the parameters used to decide the further development of ideas in your organisation?
9. Who is responsible for idea screening and decision making in your organisation?
10. How IPR management effects innovations made in your organisation?
11. How would you describe the differences between innovations done in your organisations compared to ones made in private sector?
13. What are the challenges in your organisation from the innovation point of view?
14. How would you describe a case example about an idea to launch process in your organisation?

## **3. Background questions about the case development**

1. When was the first idea for the project developed?
2. What was the target for the project development in the organisation?
3. How was the decision for setting the idea into further development made?

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4. How were people selected to work around this idea?
  5. Who was responsible for the success of the project?
  6. How important or non important was the success of the project?
    - a) In organisational point of view
    - b) Employee risk point of view
  7. What was the impact of the project development to the organisations overall goals?
  8. Where did the first idea for the project development come from?
  9. How was the idea introduced to the organisation?
  10. Describe the evolution of the idea from the begin to present day
  11. How radical was the idea of the project?
    - a) To your organisation
    - b) To the research-community
  12. How would you describe the project shift from the front end to the formal innovation stages?